AMERICAN DYESTUFF REPORTER

"Circulated Everywhere Dyestuffs Are Used"

Published by Howes Publishing Company, 90 William Street, New York.

Devoted to the practical application of dyestuffs in all industries; especially to textile chemistry—the science and practice of scouring, bleaching, dyeing and finishing.

VOLUME XVI NEW YORK, SEPTEMBER 19, 1927 No. 16

The "Soluble Vat" Dyestuffs on Acetate Silk*

The Dyestuffs, Formulas and Methods Used in Dyeing and Printing Acetate Silk and Cotton-Acetate Silk Union Materials

By CHARLES E. MULLIN, M.Sc., F.A.I.C., F.T.I.

(All rights reserved by author.)

THAT extremely interesting and comparatively new group of dyestuffs, known as the "soluble vats," have not until very recently found much use in connection with acetate silk, either alone or in combinations. In fact, most dyers do not appear to be familiar with the wide usefulness and many advantages of these products for certain purposes. These products are at present marketed only under two brands, the Indigosols of Durand and Huguenin, and the Soledons of Scottish Dyes, now a unit of the Imperial Chemical Industries, Ltd. The present paper will not attempt to even intimate the wide usefulness of these products upon cotton, wool, or silk, but will merely give some of the most recent developments in regard to their application to acetate silk and materials containing this fiber in combination with cotton.

For the benefit of those who are not familiar with the soluble vat dyes, it may be said that they present many advantages, particularly in the matter of application, over the vat dyes. As they are entirely soluble in water, without any other addition or treatment, and as it is not necessary to reduce the dyestuff with hydrosulphite, or to treat it in any other special manner, before application to the goods. This means that they can, under suitable conditions, be applied to cotton in about the same manner as the direct cotton dyes, and to wool in about the same manner as the acid dyestuffs, without any extra dyeing equipment. The color is then developed upon the dyed material by a subsequent oxidation, usually in an acid or oxidizing bath, according to the chemicals used in dyeing, to give the vat color on the fiber. This oxidation treatment corresponds more or less to the regular oxidizing treatment for the vat dyes upon any fiber.

As the Indigosols [1] and [2] and Soledons [3] are merely the old and well known vat dyes in a new water-soluble (ester) form; they offer all of the well recognized advantages of the vat dyestuffs as to color fastness, and at least in some cases, an additional fastness to certain factors, probably due to a better penetration of the goods. This latter feature is also valuable in the matter of leveling in many cases. As their aqueous solutions are practically stable in the air, they are particularly advantageous from the standpoint of fast printing colors upon all fibers. Their principal advantage is in the matter of cost. The older type of insoluble vat dyes are not cheap, and as the soluble-vats are prepared from these insoluble vat dyestuffs by a process of esterification in the presence of an inert gas, they are considerably more expensive, upon both a per pound and tinctorial value basis, than the corresponding parent dyestuffs. However, in many cases this is overcome to some extent by the saving in time, labor, etc., in their application. Also, it allows their use for purposes and upon materials where it is impossible or impracticable to use the regular vat dyestuffs. Unfortunately, the color resulting from the soluble-vat dyestuff is no more fast than that of the parent dyestuff, and this, in some cases at least, leaves something still to be desired in light fastness.

In "Acetate Silk and Its Dyes," the use of the Indigosols and Soledons upon unions containing acetate silk, for white or multicolor effects, is mentioned upon pages 210 and 373. However, in this case it is proposed to dye only the fibers accompanying the acetate silk, leaving the latter unstained by the soluble vat dyestuff. In the case of the Indigosols, which, according to the *Manchester*

*The author is indebted to C. W. Kuhl, of the Carbic Color & Chemical Company, 451-453 Washington Street, New York City, for much of the information contained in this paper.

Guard. Comm. 14, 227 (1927), in most instances appear to have a greater affinity for Celanese than the Soledons, it was formerly considered necessary to clear the acetate silk in a boiling soap bath for about one minute. However, this treatment is somewhat detrimental to the luster of the Celanese.

White Acetate Silk Effects

More recent work upon the application of the Indigosols to the cotton of acetate silk-cotton unions shows that under suitable conditions it is not necessary to clear the Celanese at the boil, and that it may be cleared in a neutral soap bath at 60 deg. Cent. (140 deg. Fahr.). Method No. 1, Formulas Nos. 1 to 10 have been applied in this manner to give white Celanese effects with excellent results. It will be noted that Formulas Nos. 1 to 5, inclusive, contain the sodium nitrite, used to oxidize the dyestuff in the dye bath. In Formulas Nos. 6 to 10, inclusive, the nitrite oxidizing agent is only used in the sulphuric acid color-developing bath.

Method No. 1. The Indigosols Upon the Cotton of Acetate Silk-Cotton Unions for White Celanese Effects. Dye the union material for a half-hour in a cold dye bath prepared as in Formulas Nos. 1 to 10. Develop Formulas Nos. 1 to 5, inclusive, for about 10 seconds at 50 deg. Cent. (122 deg. Fahr.) in a bath containing 20 c.c. of 66 deg. Be. sulphuric acid per liter Develop Formulas Nos. 6 to 10, inclusive, in a bath containing 20 c.c. of 66 deg. Be. sulphuric acid and about 10 grams of sodium nitrite per liter. Wash thoroughly until free of acid and then clear the Celanese in a neutral soap bath at 60 deg. Cent. (140 deg. Fahr.). About two minutes in this bath is usually sufficient to give a perfectly white acetate silk effect. This may later be dyed a similar or contrasting color, with special acetate silk dyestuffs if desired. Probably Formmulas Nos. 1 to 5 give the most satisfactory results.

White Celanese effects in Indigosol-dyed acetate silk-cotton unions may also be obtained by Method No. 2.

Method No. 2. White Celanese Effects in Indigosol-Dyed Cotton-Acetate Silk Materials.—Pad the material in a dye bath containing

4.0 grams Indigosol (for example, Indigosol AZG, for blue),
90.0 grams Water,
5.0 grams Gum dragon, and
1.5 grams Sodium nitrite.

Dry and develop, as in Method No. 1, in a 2 per cent solution (by volume) of sulphuric acid for 10 seconds at 50 deg. Cent. (122 deg. Fahr.). Rinse well in cold water and then in water at 70 deg. Cent. (158 deg. Fahr.), and finally soap at 60 deg. Cent. (140 deg. Fahr.).

Diethyl Tartrate in Dyeing Acetate Silk

While it has for some time been known that the Indigosols can be fixed upon Celanese by steaming for, say, 5 minutes or longer, this method does not find a very wide use, especially as a separate oxidizing process was formerly necessary to fix or develop the color upon cotton, when it was present. It has recently been found that the addition of a little diethyl tartrate to the dye bath greatly assists in the oxidation of the dyestuff upon the Celanese, and only a single color-developing treatment is necessary to develop the color on both the Celanese and cotton.

Method No. 3. Solid Colors on Cotton-Acetate Silk Unions with Indigosols.—Prepare the dye bath with

0.3 grams Indigosol (for example, Indigosol Orange HR),
80.0 grams Water,
1.0 gram Diethyl tartrate, and
14.0 grams Sodium sulphate.

Enter the goods and dye for 10 minutes at 80 deg. Cent. (176 deg. Fahr.), add 4 grams of sodium sulphate and dye for 30 to 40 minutes longer. Rinse and develop in a sulphuric acid and sodium nitrite bath, as in Method No. 1, but at about 75 deg. Cent. (167 deg. Fahr.) for 1 or 2 minutes. Rinse again thoroughly, soap, and dry. By combining Method No. 2 with Method No. 3, a blue cotton with orange Celanese is obtained.

A good fast-to-light black on acetate silk is one of the most expensive and difficult colors to obtain. It has recently been found that when applied by Method No. 4,

Formulas for Method No. 1

	Nos. 1	2	3	4	5	6	7	8	9	10
Indigosol O4B	0.3	...	...	...	...	0.3	...	...	...	...
Indigosol Violet AZB	...	0.5	...	...	...	...	0.5	...	...	...
Indigosol Orange HR	...	...	0.4	...	...	...	...	0.4	...	...
Indigosol Red HR	...	...	...	0.4	...	...	...	...	0.4	...
Indigosol Yellow HCG	...	...	...	...	0.4	...	...	...	...	0.4
Water	100	100	100	100	100	100	100	100	100	100
Sodium Sulphate	16	20	12	20	20	16	20	12	20	20
Sodium Nitrite	1.5	1.5	1.5	1.5	1.5	...	...	...	...	...
Turkey Red oil (neutral)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

Note.—Above weights are based upon 6-gram samples of mixed cotton and Celanese fabric.

Indigosol Black TB gives a black on Celanese which very well withstands exposure to the Fadeometer for 14 hours.

Method No. 4. Indigosol Black TB on Celanese.—For 100 pounds of Celanese yarn prepare the dye bath by dissolving

20 pounds Indigosol Black TB in
250 gallons of water, and then add
500 pounds calcined sodium sulphate.

Enter the goods and dye for 30 to 45 minutes at 80 to 90 deg. Cent. (176 to 194 deg. Fahr.). Rinse with a little cold water and oxidize in a bath containing

250.0 gallons water,
25.0 pounds conc. sulphuric acid, and
2.5 pounds potassium bichromate.

Work for 15 to 30 minutes in this cold bath, rinse free of chrome and acid, and soap for 15 minutes at 60 deg. Cent. (140 deg. Fahr.) in a bath containing 5 grams of soap per liter, rinse again and dry.

By Method No. 4, the exhaustion of the dye bath is only about 75 per cent, and it may therefore be used continuously to advantage. In strengthening the used bath, add the necessary weight of dyestuff to bring it up to the initial strength, but only add sodium sulphate in proportion to the volume of water to be added. In other words, for each gallon of water necessary to bring the dye bath up to volume, add 2 pounds of calcined sodium sulphate.

Printing the Indigosols

The Indigosols can be printed upon cotton-Celanese union materials so as to give a solid color upon both fibers by Method No. 5. In this case, two oxidizing treatments are necessary, in addition to a steaming operation, to fix the color upon both fibers.

Method No. 5. Printing Solid Colors Upon Cotton-Celanese Unions with Indigosols.—The printing pastes are prepared with water, neutral thickening and sodium nitrite in the following proportion: For Indigosols O, OR and Indigosol Black TB, use 1 part of sodium nitrite to 6 parts of dyestuff. For Indigosol Violet AZB, Indigosol AZG, Indigosol Yellow HCG, Indigosol Orange HR, Indigosol Red HR, and Indigosol O4B, use 1 part of nitrite to 4 parts of dyestuff. For Indigosol Scarlet HB and Indigosol Pink HR Extra, use 1 part of nitrite to 3 parts of dyestuff. Print, dry, and steam for 15 or 20 minutes. Then oxidize, first by padding on the nip with the usual 2 per cent, by volume, solution of sulphuric acid and exposing to the air for a few minutes. This develops the color upon the cotton. Without washing, the material is then further oxidized in the rope form for about 5 minutes in a sulphuric acid bath of the same strength, i. e., a 2 per cent solution by volume, to develop the color on the Celanese.

In developing Indigosols O and OR, and Indigosol Black TB, the above oxidizing baths are used at 20 deg. Cent. (68 deg. Fahr), but for all other Indigosols the oxidizing bath temperature should be 70 to 80 deg. Cent. (158 to 176 deg. Fahr.). If the Black TB is oxidized at the higher temperature, the resulting shade is brownish. However, this may be overcome by shading it with about 20 per cent (on the weight of Black TB) of Indigosol O4B, when the color may be oxidized at the higher temperature. In case it is desired to avoid the low temperature oxidizing treatment of Indigosols O and OR, these can be substituted by Indigosols O4B and AZG, which may be used at the higher temperature. After the oxidation, the goods are rinsed free of acid, and if necessary, soaped at not over 60 deg. Cent. (140 deg. Fahr.).

Diethyl Tartrate in Printing

As previously mentioned, the use of diethyl tartrate in dyeing or printing the Indigosols upon either all-Celanese goods or cotton-Celanese unions greatly facilitates the subsequent oxidation of the dyestuffs upon the acetate silk. For example, by Method No. 6, using about 2 per cent of diethyl tartrate in the printing paste, the double oxidizing treatment described in Method No. 5 may be entirely avoided and equally as good, or even better, results obtained by a single very short oxidation, developing the color upon the two fibers simultaneously.

Method No. 6. Printing the Indigosols Upon Cotton-Celanese Unions with Diethyl Tartrate—Prepare the printing pastes as in Formulas Nos. 11 to 16, inclusive. Print, dry, steam for 30 minutes and oxidize for 0.5 to

Printing Paste Formulas for Method No. 6.

	Nos. 11	12	13	14	15	16
Indigosol Yellow HCG	3.0	....	....	....	....	....
Indigosol Orange HR	....	5.0	....	....	....	....
Indigosol Red HR	....	....	6.6	....	....	....
Indigosol O4B	....	....	....	4.0	....	....
Indigosol Violet AZB	....	....	....	....	8.0	....
Indigosol Black TB	....	....	....	....	....	12.0
Water	34.0	32.0	30.0	33.0	29.0	25.0
Gum dragon thickening (1:10)	60.0	60.0	60.0	60.0	60.0	60.0
Diethyl tartrate	2.0	2.0	2.0	2.0	2.0	2.0
Sodium nitrite	1.5	1.5	1.5	1.5	1.5	1.5

1 minute at 70 deg. Cent. (158 deg. Fahr.) in a bath containing 20 c.c. of concentrated sulphuric acid per liter.

REFERENCES

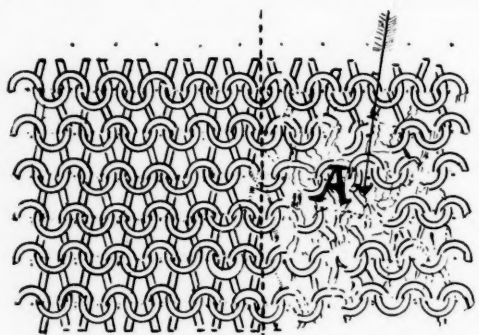
1. "A New Form of Soluble Indigo and Other Vat Dyes," Textile Colorist 47, 22-27 (1925).
2. "Soluble Tetrabromoindigo and Its Application," Textile Colorist 47, 88-89 (1925).
3. "Another Water-Soluble Vat Dye—Soledon Jade Green," Textile Colorist 47, 568-571 (1925).

Bleaching and Dyeing Knit Goods

Without Detriment to Their Structure

By George Rice

THE bleaching and dyeing of knit goods without impairing their softness, elasticity, strength, luster and other general properties that make these fabrics adaptable for an ever-increasing range of wearing apparel, is more of an art than is commonly supposed. Some years ago, when the knitted texture was limited chiefly to underwear, hosiery and certain sporting goods, the question of bleaching and dyeing fabrics made on the looped principle involved mainly a good white or a good color. So long as the bleach and the color were satisfactory, it did not seem to matter much if the texture was somewhat weakened in structure, the original soft feel of the raw material changed to harshness, stains produced and oftentimes chloride and acid residues left in the goods. But conditions in the knit goods industry are different now. There are knitted cloths for use in the manufacture of men's wear and ladies' dress goods of many descriptions. There are fabrics made on the warp knitted principle for drapery purposes and trimmings of all kinds. Shawls, jerseys, waistcoats, silk facings, linings, imitation seal-



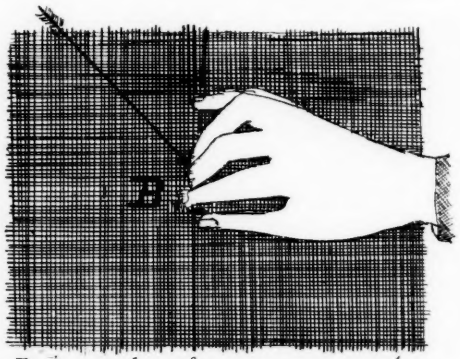
Sometimes the looped structure of knit goods is tendered, and frayed during the bleaching

Fig. 1.

skins, astrachans, backed cloths, and many other kinds of textiles which formerly were made of a woven fabric are now made of a knitted fabric.

Goods of this class have to be bleached or dyed without impairment of their natural softness or the pliability of the loops composing the knitted structure.

There are ways to restore the softness of knit goods which have been harshened in bleaching or dyeing, for there are plenty of softening compounds available. But it is best to bleach and dye in such a way that the original softness of the goods is retained. We have seen



When the fingers can be pushed through bleached cloth the probabilities are that the bleacher erred somewhere. Fig. 2.

many pieces of knit goods hardened in texture by the use of too much caustic alkali and too long boiling in the bleach. Many fabrics of this class are now whitened for a light color. Usually it is enough to decolorize the seed specks in such goods and a full bleach is hardly necessary.

A boil in soda ash will dispose of the seed specks, particularly if it is followed up with a dilute lime bath. The object is to get the goods sufficiently white for taking a good color, not to make a white which will be permanent. Yet we have noticed dyers and bleachers wasting time, effort and materials in striving for a beautiful white long after the seed specks have been eliminated, a commendable but unnecessary procedure for goods that will immediately be dyed.

Knit Goods Tendered During Chemicking

Tendered knit goods are not only lowered in commercial value, but tend to injure the reputation of the manufacturer, who usually has to take the blame for trouble caused by the bleacher or the dyer in the chemicking operations. There are several methods of chemicking knit goods, one of which consists in submerging them in a bleach tank for a sufficient time to whiten them. Another is to run them through a roll machine containing the bleaching liquor. Or in some plants the goods are put through the bleaching liquor, squeezed and piled. The stoving plan is also used.

Intensive or overbleaching are likely to develop a tenderness in the knitted structure that may prove detrimental to the goods. Chloride of lime bleaches fast when the goods in process of treatment are subject to the action of air, as is the case when they are drawn through the bleach liquor, squeezed and piled. Speed and production result.

and usually a good bleach. But overbleaching may tender the goods in places. The affected parts may not weaken at once, sometimes not until the goods are in the market. We show in Fig. 1 a specimen of knitted cloth which was intended for ladies' cloaking. It was practically all wool, as but little cotton was used in the yarns. It presented a smooth, firm and well-finished appearance except in spots. These places were rough, frayed and disordered and could be further roughened by simply rubbing them with the hand. The loss of fiber thinned the fabric so that it was nearly transparent. A magnifying glass made it look like the broken area shown at A in Fig. 1.

Careless Throwing of Bleach Liquor

We were in a bleach house where a man was in the act of throwing bleach liquor into the kettle with a pail. The solution splashed on the goods at every throw. The machine was running all the while and apparently the bleaching liquor became well distributed. That plant was troubled with uneven bleaching and there is no doubt that the method of entering the liquor had something to do with it. Some time later a new boss dyer took charge and when we again visited the plant we noticed that the pail thrower no longer used the hand dumping method A pipe had been run from the tank containing the bleach solution to a point below the surface of the liquor in the steam box of the kettle. That part of the pipe within the kettle was perforated so as to discharge the chloride of lime evenly throughout the machine. All the attendant had to do was to regulate the controlling valve instead of lugging pails of the concentrated solution some distance and splashing the liquor about.

Knitted fabrics may also get tendered when they are dyed in the raw stock, the yarn, the roll or the garment, as well as in the bleaching. In dyeing full fashioned and seamless knit goods, it is not always an easy matter to get the dye to penetrate the seams, and the thicker parts of the garments that are turned or folded and an uneven penetration of the color frequently happens. Some cotton garments had been dyed and sent to the bleach house to be softened. Too much Turkey Red oil was used as the softening agent, and as might be expected a castor oil odor remained. In trying to get this odor from the goods with a weak acid solution the fabric was so weakened that the fingers could be thrust through as shown at B Fig. 2. The bleacher had erred in his judgment and tendered goods resulted. Turkey Red oil is a good softener, and often will improve the color of the goods by giving it a softer tone, but like any other active ingredient, it will create trouble if not properly used.

The Physicist and the Wool Fiber

Extension at Breaking Load Found by Speakman—The Stress-Strain Test—Explaining the Behavior of the Wool Fiber

By H. A. GOODMAN

THE place of the physicist in textile research, as well as in some of the daily routine testing, is at last coming to be recognized. Not only has modern textile research a physico-chemical slant, but some lines are almost pure physics, if there is any such thing.

For example, if wool is to be investigated for its strength after treatment with alkali or any other reagent, this is accomplished by a simple physical test, usually on the yarn. Owing to the natural irregularity of the yarn, many tests have to be made in order to be sure that an average is established. Some form of statistical treatment is advisable in order to insure in turn that the average truly represents the sample. Enough breaks must be made in every test so that the possible error in the average will not be comparable in size with the effect that is being tested or sought.

There is a very large amount of work in such a group of tests, for each series should be carried out until one or more tests, even though it be the highest value or the lowest, will have no appreciable effect on the result. Only then are the original and the values modified by treatment comparable.

Elongation of Fiber in Saturation Atmosphere

Ordinary tensile strength tests on single fibers are not very useful for such work, because there are great natural variations from fiber to fiber. A more suitable standard of reference than either has been sought; that is, some property that does not change from fiber to fiber and which can be measured with reasonable ease.

Speakman, in the Journal of the Textile Institute (15, T529, 1924), thinks that he has found this in the elongation in a saturated atmosphere.

Fibers of quite different breaking loads but from one kind of wool showed a remarkably uniform *extension* at the breaking load, so nearly constant that its value can be accepted as a characteristic of wool. At least one other kind of wool seems to agree with it. The value is surprisingly large, practically 70 per cent, and was measured by slow stretching at 16 deg. Cent. in an atmosphere that was saturated with water vapor. It may be unfamiliar, but it is not a difficult property to measure or to understand.

Speakman's conclusion can well be copied in full as

stating in as clear a manner as possible the value of this discovery: "It has been proved that the extension at breaking load of wool fibers, as measured under particular conditions, is a constant quantity. From a purely scientific point of view, at least, it is of fundamental importance to have found one property that does not vary from fiber to fiber. Hitherto, any investigation which concerned the action of various reagents and processes on wool was always open to doubt on account of the great range of variation in fiber properties. Such investigations can now be carried on with certainty on single fibers using the 'extension at breaking load in saturated air' as a measure of any change taking place."

The idea of elongation and the preparation of stress-strain curves for yarn was treated by Goldthwait in the REPORTER January 10, 1927.

Single fibers require somewhat different apparatus, but the principles are the same. The curves for wool vary with the atmospheric conditions, but in a saturated atmosphere if loads are plotted horizontally and extensions vertically, the curve starts as a straight line with but little slope, and then shoots suddenly upward, changing to a little less slope at the higher loads.

STRESS-STRAIN TESTS

The stress-strain curve is merely the record of how a material stretches as the load upon it is increased. In the case of a yarn, the curve is very sensitive to various changes; that is, kinds of treatment to which it may be subjected, whether chemical or mechanical. One of the best examples of this type of physics is found in *Mark, Beitrage zur Kentnis der Wolle und ihrer Bearbeitung*, where there are curves for various wools and numerous applications. One problem illustrated was that of trying to get a carded yarn to show the same kind of a curve as a combed yarn. During the experiments yarns were subjected to bisulphite, steam, ammonia and other treatments, stretched and dried. Then the resulting yarn was tested for its elastic properties. There is no immediate purpose in going into detail, but the effects of the treatments were very clearly reflected in the curves and indicate that there are possibilities here for studying the processes in the yarn form as well as in the single fibers.

The type of stress-strain curve of the fibers is shared in a modified form by the yarn, the sharp point of inflection if present being the physicist's elastic limit. Yarn, therefore, should be constructed and tested not only for strength but for the elastic limit as well. A high elastic limit denotes good elasticity and less tendency to pull out of shape. The effects of various processes on elastic limit are undoubtedly of practical interest.

Questions like shrinkage, which are by no means confined to goods manufactured from wool, will eventually be explained as fiber phenomena. Strains are set up in the goods during manufacturing which, of course, are in the individual fibers. Some of these are released on wetting and this partly accounts for shrinkage, which is now looked upon as closely connected with the elastic properties of fibers. The swelling of the fibers on wetting is undoubtedly another contributing factor.

These are physical properties, or at least physical quantities, whose measurement requires rather special physical apparatus. The example is representative of many unsolved problems having to do with wool, and other fibers as well. The difficulties of manipulation are not so great in handling wool as with single cotton fibers, but measuring fiber diameter and changes of diameter or cross-section are delicate enough problems to require real physicists. Single fiber measurements are merely given as typical of the simpler physical problems that have to be solved in modern fundamental textile research.

EXPLAINING THE BEHAVIOR OF WOOL

Not the least service of the physical method is the light that it is throwing on the internal structure of the wool fiber. Speakman and Shorter, working independently, have reached somewhat similar views by somewhat similar means. They are not in complete agreement; and since for the present purpose the views of one are as good as those of the other, Speakman's, which are the latest at hand, have been taken for the illustration. He considers that the behavior of a wool fiber under stress is the same as that of a single cell, and the single cell is composed essentially of—

"1. An elastic cell wall enclosing

"2. A fibrillar structure which is not in physical equilibrium with

"3. A viscus phase of gelatinous character included in its interstices."

This theory was developed almost entirely from stress-strain (or stress-strain-time) diagrams of single wool fibers.

Another method, studying the rate of extension of wool fibers under constant stress, showed distinctions between different kinds of wool. Not only was the presence of a gelatinous phase in the wool fiber confirmed, but it was shown to vary in composition from one kind of wool to another, and to vary with the temperature. It seems probable that decreasing viscosity of the viscous phase promotes suppleness of the fiber and must contribute to the "handle" of the wool. These physical methods are thus increasing our knowledge of the true nature of wool and leading up to new ways of studying and defining its characteristics.

IMPORTED DYESTUFFS PRICES IN GREAT BRITAIN

Average prices for British produced dyestuffs are not available, but the following figures, compiled by a leading trade association, show the average selling prices of imported coal tar dyestuffs, and give an indication of the general trend of prices, an increase in the average price per pound being noted in 1926 over the corresponding 1925 figure. This increase is explained largely by the use of better grades of dyes rather than by price increases, as in fact there have been a number of price reductions during the year as compared with 1925. The information is supplied by Trade Commissioner H. S. Fox of London.

A special circular has been issued embodying information regarding the source of the raw materials upon which the dye industry of Germany is based. The circular starts with coal and the by-products manufacture and shows the production of coal tar crudes for 1913 and 1925. Copies are ready for distribution upon request to the Chemical Division.

Prices of Imported Coal Tar Dyestuffs in the United Kingdom

Year	Pence per lb.†	Increase over 1913 in per cent	Tons*	Value* per lb.
1913	11.7	...	18,394	1,892,055
1920	79.2	577	10,397	7,552,799
1923	49.8	326	2,808	1,004,482
1925	42.99	267	1,981	646,903
1926	47.94	310	1,892	876,529

†Exclusive of Alizarine and Synthetic Indigo.
*Tonnage and value figures include Alizarine and Indigo.

Dyeing of Hosiery Containing Mixed Fibers

Dyeing Wool-Cotton Mixtures—Solid Shades and Two-Color Effects—Wool-Rayon Combinations—Wool-Silk and Cotton-Rayon Mixtures—Cotton-Silk Mixtures

By W. A. EDWARDS and G. F. HARDCASTLE

HOSE consists of knitted fabric made into a form of garment. The dyeing of knitted fabric in bulk is similar to the dyeing of woven fabric, except in one or two particulars, but in the dyeing of hose there are other factors to consider. In the making of a stocking there is usually a seam formed where the edges of the material are stitched more or less tightly together. Also a form of seam is obtained by the joining or linking of the toes. While the bulk of the material is easily penetrated, these seams are more difficult to deal with. Frequently also in those parts of the hose which are most subject to wear there are denser portions, known as splicings, consisting of a reinforcement by an extra thread of the same or a different fiber, the yarns used for this purpose being usually harder twisted. These splicings are more difficult to penetrate, and the heels and toes, when wet, have a tendency to turn inward, which again causes difficulty in penetration. In the boarding operation of the finishing process the heels, toes and seams are stretched out, and any parts which are not thoroughly dyed become visible.

In the preparation of the hose for dyeing, the different sizes or batches are first marked, so as to be readily sorted afterwards. Hose consisting of wool, alone or mixed with other fibers, are usually turned inside out, and are best dyed in this way, but cotton and cotton mixtures, other than with wool, can be dyed satisfactorily right side out.

In nearly all cases the hose will require some scouring before being dyed. Wool and wool mixtures are usually scoured with a good soap and a little mild alkali, such as ammonia or soda. If very greasy a little of one of the special solvents may be added to the scouring bath. Cotton and cotton mixtures are often fairly clean, and merely require wetting out. Where scouring is necessary it may be done in soap and alkali with the addition of a solvent if necessary. In some cases, however, the use of alkali may cause trouble in the subsequent dyeing, and, if so, the alkali is best left out.

Dyeing Wool-Cotton Mixtures

The type of dye-vat or machine used is important, as it is necessary to be able to control the temperature of the dye liquor within fairly narrow limits, but there are several good machines for this purpose on the market.

In many cases direct cotton colors will give a solid shade on the two fibers from a neutral bath if the temperature be carefully regulated. In some cases, particularly violets and browns, the tone on the two fibers may vary, and this may be corrected by adding to the same bath a suitable neutral dyeing acid color to tone the wool, or a direct color which does not appreciably dye the wool to bring up the shade of the cotton. For pale or medium shades it is better to work without assistants excepting penetrating agents such as tetracarnit, etc., using Glauber salt afterwards in the cooling bath to feed the cotton if necessary. For dark shades the use of Glauber salt is

required to help in the exhaustion of the bath. It is also very essential that the temperature should be carefully regulated. Too long boiling will strip color from the cotton and fix it on the wool, which will become too heavy in shade. Some dyers prefer to work neutral dyeing acid colors for the wool, and use for the cotton those direct colors which chiefly dye the cotton. While it is possible to obtain a high degree of solidity by this method, it must be remembered that the resulting colors may not be so fast if care is not taken in selecting suitable wool dyes. Where it is necessary to boil for some time in order to get penetration, this method is preferable, as the relative shades on the two fibers can be better regulated. In plaited hose, where the wool is on the surface and the cotton at the back, solidity of shade is most important, because when the hose are stretched in wear the cotton back may show through.

Two-Color Effects

For the brightest and best results a two-bath method is advisable. The wool is dyed first with those acid dyes which, from a strongly acid bath, leave the cotton clear or nearly so, preferably using sulphuric acid, and afterwards well washing off. The cotton is then dyed from a cold or lukewarm concentrated bath containing salt, choosing colors which are least likely to stain the wool. It is useful to add to the dyebath small quantities of agents such as borax, sodium phosphate, etc., which tend to prevent the wool fiber from taking up the cotton color.

It is possible, by selecting suitable colors, to obtain two-color effects from one bath, but where brightness and contrast are of importance the method is not suitable, and, further, the matching of a standard pattern is difficult.

Wool-Rayon Mixtures

Here the general methods employed are similar to those given under wool-cotton mixtures. There are, however, one or two points of difference which should be mentioned. As a rule, artificial silk has a much greater affinity than cotton for the direct colors. Care must be taken to choose the most suitable dyes and to use such assistants as Glauber salt very cautiously. In the case of plaited goods, the treatment should be as short as possible to avoid fibers of wool coming through the artificial silk surface, and giving a hairy appearance; also, boiling should be as short as possible in order to preserve the artificial silk fiber.

Wool-Silk Mixtures

Most of the hose containing these two fibers is required to have the wool dyed only and the silk left clear. The silk in this case has already been freed from gum, and is usually twisted with the wool by the spinner, or the fibers are worked together on the knitting machine. The wool is dyed with acid colors selected from those which leave the silk colorless or nearly so. It is essential, in order to keep the silk as clear as possible, that the goods be entered at a high temperature in a bath strongly acid with acetic or formic acid, or if care be taken a small amount of sulphuric acid may be used. Usually some slight staining of the silk occurs in spite of these precautions, and if it is essential for the silk to be as white as possible, it is best cleared by treating in a fresh boiling bath containing ammonium acetate. If care be taken, a weak hydrosulphite bath may be used. In either case allowance must be made for the removal of small amounts of color from the wool. Some dyers use a lukewarm bath containing bran. In other cases the wool and silk are dyed a solid shade or each fiber a different color.

Solid shades may be dyed with the colors suitable for gloria fabrics, and may be either acid, direct, or basic dyes.

Basic dyes are applied from a boiling or nearly boiling neutral bath, but are not much used unless specially bright colors are required.

Acid dyes are applied from a bath containing acetic or formic acid and Glauber salt. Dyeing is commenced about 70 deg. Cent., the bath is brought to the boil in half an hour, and is kept boiling until the wool is nearly deep enough. It is then cooled to about 60 deg. Cent., and the material is worked until the silk is up to shade. It may be necessary to add more color for the silk. The temperature at which both fibers are dyed solid can be found by experiment, but only those dyes are suitable which dye solid shades above 80 deg. Cent., because wool is not well dyed below this temperature.

Direct dyes are best dyed with 5 to 20 per cent Glauber salt, according to depth of shade. Enter at 50 to 60 deg. Cent., raise to boil, and boil gently for one-half to three-quarter hour. Shut off steam, and allow to dye in the cooling bath. For heavy shades add the color in portions as dyeing proceeds. Some direct dyes, particularly blues, may require a little acetic acid. In general, many direct dyes give solid shades on wool and silk at about 90 to 100 deg. Cent. While many will dye silk well at less than 40 deg. Cent., they scarcely dye the wool at this temperature.

For two-color effects the wool is dyed first with colors which either dye the silk very little or not at all in a boiling strongly acid bath as before mentioned. Where the silk needs clearing the methods already described may be used. The ammonium acetate method is best, but often a boiling bath containing a little acetic acid is all that is necessary. The silk is next dyed in a fresh lukewarm acid bath, using selected acid dyes or such direct dyes as are unaffected by the acid, and do not go on to wool.

Cotton-Rayon Mixtures

This is perhaps the commonest form of mixed fiber hose with which the dyer has to deal. Usually the panel is of artificial silk with cotton tops, toes, heels, etc. Selected direct cotton colors are generally used which give the same tone and depth of shade on both fibers. Many

direct dyes dye artificial silk a deeper shade than cotton, while others give a different tone on the two fibers. When pale shades are required it is fairly easy to obtain solid effects, but it is much more difficult to obtain solidity when dyeing heavy shades, such as nigger browns and navy blues. Those colors which give the most solid results on cotton-viscose material are also among the best for producing level results on the varying qualities of viscose.

Dyers usually have their own methods of preparation suited to the class of goods they are handling. Some scouring is usually necessary, even if only slight. In the case of hose consisting of mercerized cotton and artificial silk, more uniform results are obtained by entering the goods dry, thereby giving the artificial silk a better chance of taking up its share of the color. This may also apply in some cases with ordinary cotton and artificial silk, particularly with certain dyes which tend to dye the cotton deeper than the artificial silk. For light and medium shades the bath is best without Glauber or common salt, using these towards the end of the dyeing if necessary. Dark shades will usually require an addition of salt. In all cases a small addition of about 1 per cent Turkey Red oil is of advantage. The bath should at first be lukewarm, working gradually up to the boil. Boiling is continued for a short time until the color is level, and then dyeing proceeds in the cooling bath until the proper shade is obtained. Salting-on for shading is better done at a lower temperature, but the type of color used must be a deciding factor. It is important to get as near the final shade as possible in the fist instance, since, when dealing with mercerized cotton and artificial silk, shading done afterwards frequently makes the mercerized cotton darker than the artificial silk. A higher temperature and more Glauber salt will generally cause more color to be absorbed by the artificial silk in mixtures of that fiber and cotton.

Cotton-Silk Mixtures

This class of mixed fiber hose usually has a panel of silk (in the gum), and tops, etc., which may be of ordinary cotton but more frequently are of mercerized cotton. It is necessary to degum the silk, and this may be done either previous to dyeing or at the same time. Where the degumming is done previous to dyeing, the usual method is to treat the material in a hot or nearly boiling soap bath, using a neutral olive oil soap, for 20 to 30 minutes; 5 to 10 per cent soap is usually sufficient, but this, with the time of treatment and the temperature, will depend on the silk, as some varieties will need longer treatment than others.

The dyeing of the material can be carried out in the same bath by adding the necessary colors. While some dyers prefer to use a separate bath, the practice of degumming and dyeing in one operation is now becoming more common. In this process the degumming agent is usually a mixture of sulphonated oil and sodium silicate. This mixture, along with the dye, is added to the bath, and the material entered warm, raising gradually to the boil. It is worked at the boil until the silk is thoroughly degummed, and then matched up to see how the dyeing is progressing. Further additions of color are made, and dyeing continued until the required shade is obtained.

The colors selected for dyeing this silk-cotton mixture must have the property of giving uniform shades on both fibers. The direct colors are mostly used, but, as previously stated, some of them, notably browns and violets, do not give the same tone on the two fibers, and the silk will require shading to the cotton. This is done with neutral-dyeing acid colors which will dye the silk and will not stain the cotton. It may be necessary towards the end of the operation, if the silk is not deep enough, to use a little acetic acid. In dyeing mode shades, colors must be chosen which dye at or near the same temperature and give similar tones on the two fibers. Some dyers prefer to use colors which dye the cotton and leave the silk practically clear, and fill up the latter with acid colors which work in a neutral or alkaline bath, and do not affect the cotton to any extent. This frequently means, in the case of mode shades, the use of at least six different colors, but in spite of this it is often easier to get uniformity of color on the two fibers in this way.

In conclusion, mention might be made of the so-called Celfect hosiery, which is made of cotton and Celanese silk. In this material colors are easily obtained. Care must be taken in the preparation and dyeing of these goods to keep the alkalinity low and not use too high a temperature, in order to preserve the properties of the Celanese.—Journal of the Society of Dyers and Colourists.

GOVERNMENT DYEING SCHOOL IN INDIA

Instruction in dyeing and bleaching is given at the Government Dyeing School operated at Shadara, India. Since the opening of a model dyeing plant the course has provided theoretical training combined with practical training under actual mill conditions. A research laboratory is maintained in conjunction with the school, and a calico printing section has recently been added. The institution has turned out from 1916 to 1925 more than 300 students trained in the art of dyeing, according to the Department of Commerce.

The dyeing industry in the United Provinces is also making satisfactory progress. Some of the large dyehouses at Cawnpore have been considerably extended and improved recently. Progress in printing, especially in block cutting at Furukhabad, was maintained, and at Muttra a calico-printing factory of multi-colors has been started. The printing industry at Lucknow, however, showed decline. With a view to assisting the industry at Lucknow, it has been decided to start a dyeing and printing school at Bulandshahr. By conducting a large number of demonstrations, the skilled use of fast colors has been considerably popularized. American manufacturers would do well to submit adequate samples of their dyes to the school for examination and practical test, and to co-operate with suggestions for obtaining best results from their samples.

Determining Liquefying Capacity of Diastatic Products

By S. LIEPATOFF, Moscow

(*Melliand's Textilberichte*, 1927, 541-544.)

Translated by Ismar Ginsberg, B.Sc., Chem. Eng.

IT has been shown that the determination of the coefficient of liquefaction of diastatic products can be based on viscosity. The present work has for its purpose a somewhat more detailed study of this question, which is of very great importance in quite a series of technical processes. Experiments were instituted for the purpose of defining the governing conditions more closely.

The abundant literature on this subject yields the fact that the existing methods for the determination of the capacity of liquefaction in ferments may be grouped into three classes. First, there are the calorimetric methods, which determine the moment at which liquefaction takes place, by reaction with iodine (*Wohlgemuth, Zeitschrift fuer analytisches Chemie* 1909); second, the mechanical methods, which are based on the determination of the viscosity at the moment of liquefaction; and, third, there are the chemical methods, which are based on the determination of the amount of sugar formed during liquefaction. (See M. Tschilikim, *Ber. Manuf. Industrie, Russia*, 535, 1913.)

The first and second methods (the chemical is suitable for certain ferments) are not considered by the author, as his attention is all given to the interesting mechanical method. Various experimenters have busied themselves along these lines and have developed certain information of value. It has been shown that there is a great difference betwen the first and the following determinations, which is apparently due to the internal change in the emulsified structure of the starch on being repeatedly sucked through the capillaries.

As will be seen later, the repeated suction of the starch through the capillaries has no noticeable action on the starch emulsions if a viscosimeter with a comparatively large capillary diameter is used. The observations which have been made along these lines may perhaps be explained by the fact that the activity of the ferment had not been completely destroyed. It may also be possible that the viscosimeter did not have a sufficiently wide capillary or that the viscosity of the starch solutions varied. It is important for us to make this point: that the well-prepared starch emulsions gave somewhat different degrees of liquefaction and showed the following slight deviations in time of flow through the viscosimeter:

2 min. 15 sec.; 2 min. 14 sec.; 2 min. 12 sec.; 2 min. 13 sec. Average: 2 min. 14 sec.

7 min. 18 sec.; 7 min. 8 sec.; 7 min. 13 sec.; 7 min. 13 sec. Average: 7 min. 13 sec.

9 min. 30 sec.; 9 min. 21 sec.; 9 min. 40 sec. Average: 9 min. 30 sec.

Such small deviations in the results can have no appreciable influence on the accuracy of the method and the reliability of the determinations. This contention is substantiated by the fact that the results in the following tabulations, which are the average of three separate determinations, do not vary more than ten seconds.

Method of Making the Analysis

The further working out of the method led to the determination of the coefficient of liquefaction of all sorts of diastatic products. This is not a difficult analysis to make if the viscosity of the starch solution is determined as being dependent on the duration of the action of the ferment on the solid starch. Thus the curve that represents the rate of the reaction suddenly changes its direction and thereafter runs almost parallel to the X axis. The moment at which this phenomenon takes place is accurately determined in the experiments which will be described below. A still more accurate and complete method for determining the point at which liquefaction takes place is also described.

The method used in the experiments is as follows: A 3 per cent solution of the starch paste is prepared in the usual manner. It is first heated up to a temperature of 70 deg. Cent., and then boiled for ten minutes. A certain amount of the diastatic product being tested is added to 600 grams of this solution, which has been cooled down to 37.5 deg. Cent. Then, after a certain definite period has elapsed, determined with the aid of a stop-watch, a sample of 50 c.c. is taken by means of a pipette and transferred into a beaker which has been previously prepared and contains acetic acid. The action of the acetic acid rests in the fact that it stops the liquefying action of the diastatic product. This method is carried out with hydrolin and biolase, which were used in these experiments.

Thereafter the time it takes for the liquid to flow out of an Ostwald viscosimeter is determined, the temperature being 20 deg. Cent. The viscosimeter is used in its first and primitive form (see *Arrhenius, Zeitschrift fuer phys. Chemie*, 1, 285, 1887), which means that the viscosimeter is merely a pipette of 10 c.c. capacity with a capillary outlet. The diameter of the capillary is ½ millimeter and the volume of the small bulb is 50 c.c. The determinations were repeated three to five times with this instrument, so that the results obtained were averages of a number of determinations.

When the time it takes the starch solutions to flow out of the viscosimeter is used in drawing the scale of the X axis, and the time it takes for corresponding solutions of starch, which have not been subjected to the action of the diastatic product for different periods, is used in drawing the scale of the ordinates or Y axis, then it is possible to determine the coefficient of liquefaction with a considerable degree of accuracy. For the viscosity curve falls sharply within the first few minutes of the action of the diastatic products on the starch; then it changes its direction at a certain definite moment and thereafter runs almost parallel with the axis or abscissae.

The location of this point cannot be accurately calculated. The author has, however, been able to counteract the errors that occur in a mathematical determination in the following manner:

The curve which is shown in Fig. 1 was divided into two parts. The upper corresponds to the liquefaction that ensued during the first few minutes of the action of the diastatic products on the starch, and slopes sharply toward the horizontal axis. The lower part runs almost parallel to the X axis.

This curve has an asymptotic path. If, however, reciprocals of the time of liquefaction are plotted on the X axis of this curve, then the lower portion of the curve assumes a normal form; that is, a curve is obtained which approximates a logarithmic curve, and at the same time the upper portion of the curve, which represents the first few minutes of the diastatic reaction, runs parallel to the horizontal axis and deviates from the logarithmic curve.

This changed curve may also be divided into two parts. The lower portion of this curve can be satisfactorily expressed in algebraic terms by means of the following equation: $\frac{1}{t} = \alpha \eta_i K$.

In this equation the left-hand side, $\frac{1}{t}$, represents the reciprocal of the time of liquefaction, η_i is the time that it takes the solution to flow out of the viscosimeter, while α and K are constants. The logarithm of both sides of this equation is taken, and then it assumes the following form, which is of practical value:

$$\log \frac{1}{t} = \log \alpha + K \log \eta_i$$

If now the values of the $\log \frac{1}{t}$ are plotted on the X axis and those of the logarithm of the time of outflow from the viscosimeter, $\log \eta_i$, are plotted on the vertical axis, a curve is obtained which changes its direction at one point only.

The abscissa of this point, as read off the horizontal axis, gives the time at which the change in direction of the curve takes place and indicates the time at which the liquefaction of the starch is almost completed. This conclusion will now be illustrated with an example which shows more clearly its significance.

Results of the Tests Tabulated

In making this experiment, 600 grams of a 3 per cent starch solution were treated with 0.7 gram of hydrolin. The results obtained in this test are given in tabulation I. The logarithmic values of these results are shown in the last two columns of this tabulation.

TABULATION I (Hydrolin + Starch)

Time of Liquefaction t	Time of Outflow of Solution from Viscosimeter η_i	$\log \frac{1}{t}$ .1000	$\log \eta_i$
0 sec.	1,643 sec.	.....	.....
80	686	1.0969	2.8363
155	513	0.8096	2.7101
261	336	0.5798	2.5263
322	289	0.4914	2.4609
395	226	0.4031	2.3541
460	196	0.3424	2.2923
520	164	0.2833	2.2148
600	147	0.2227	2.1673
871	108	0.0414	2.0334
922	93	0.0334	1.9685

When the values in the last two columns of tabulation I are employed and the values of $\log \frac{1}{t}$ are plotted on the horizontal axis and those of $\log \eta_i$ are plotted on the vertical axis, the curve shown in Fig. 2 is obtained.

It may be seen from this curve that from the time point of 266 seconds on, the additional points do not fall on the curve but are closer to the horizontal axis. The time, 266 seconds, then, represents the duration of the action on the diastatic product on the starch preparation, during which liquefaction is practically ended. When this method is employed, it is nevertheless im-

possible to speak of an absolute completion of the liquefaction process, but only of a practical cessation of the process. But inasmuch as the liquefying action of the diastatic products is particularly vigorous at the start—that is, during the first few minutes—and then becomes weaker as the process progresses, it is really of no purpose to speak of an end of the reaction.

The following experiments have been carried out with Biolase C20 and had for their purpose the determination of the various conditions that govern the speed of liquefaction. What we refer to here is the action of the quantity of the diastatic product used, the temperature at which the reaction takes place, the action of salt in the mixture, which has been stated to have an accelerating influence on the liquefying powers of various diastatic products. A solution containing 0.3 per cent of Biolase was prepared for these experiments and a certain definite number of cubic centimeters of this solution were used.

The results of these experiments are given in the following tabulations II to VIII, inclusive:

TABULATION II

10 c.c. of 0.3% Biolase C20 + 600 grams of 3% solution of starch; temperature 37.5° C.

t	η	t	η	t	η	t	η
0	1,700	187	340	357	155	541	107
52.5	790	245	259	431	126	625	82
117	524	301	192	482	115		

TABULATION III

5 c.c. of 0.3% Biolase C20 + 600 grams of 3% solution of starch; temperature 37.5° C.

t	η	t	η	t	η	t	η
0	1,790	193	1,200	409	608	655	302
47	1,670	264	1,000	463	465	676	275
130	1,469	329	852	524	418		

TABULATION IV

10 c.c. of 0.3% Biolase C20 + 600 grams of 3% starch; temperature 37.5° C.

t	η	t	η	t	η
0	1,700	221	416	473	163
50	1,004	293.5	296	531	142
111	713	348	238	600	128
165	631	422	186		

TABULATION V

10 c.c. of 0.3% Biolase C20 + 600 grams of 3% starch; temperature 50° C.

t	η″	η′	t	η″	η′
0	1,650	.....	312	184	3′ 04″
53	925	15′ 25″	350	145	2′ 25″
107	631	10′ 31″	401	121	2′ 01″
162	443	7′ 23″	445	110	1′ 50″
207	335	5′ 35″	505	87	1′ 27″
261	239	3′ 59″			

TABULATION VI

10 c.c. of 0.8% Biolase C20 + 600 grams of 3% starch solution; temperature 60° C.

t	η	t	η	t	η	t	η
0	1,680	151	285	271	151	538	68
39	741	193	219	338	122	702	54
75	507	239	175	487	79		

In order to determine just how accurately this method is, when the constants of the viscosimeter are given due consideration, a series of experiments were undertaken with a viscosimeter of the same type but possessing a volume of 25 c.c. and a capillary diameter of 0.3 millimeter. The results obtained in these experiments are given in tabulations VII and VIII.

TABULATION VII

10 c.c. of 0.3% solution of Biolase C20 + 600 grams of 3% starch solution; temperature 38° C.

t	η	t	η	t	η
0	1,921	239	177	406	88
107	377	298	129	485	70
181	242	348	104		

TABULATION VIII

10 c.c. of 0.3% solution of Biolase C20 + 600 grams of a 3% starch solution; temperature 37.5° C.

t	η	t	η	t	η	t	η
0	114	182	43	350	35	483	34
51	65	239	39	399	34		
119	54	293	36	438	34		

The results in the last tabulation were obtained with a rough viscosimeter which was made right in the laboratory, and which consists of a pipette of 50 c.c. capacity, the bore of which was brought down to a diameter of 1 millimeter.

The time within which the process is completed is equal to 176, which means that it is almost the same as that found in the similar experiments carried out with another viscosimeter (see tabulation II).

In calculating the liquefying capacity of the various diastatic products investigated in these experiments, of starch liquefied by 1 gram of diastatic product at a temperature of 37.5 deg. Cent. during a period of thirty minutes. Then, again, if the time in which 0.015 gram of Biolase liquefied in its entirety 600 grams of a 3 per cent solution of starch is 5 minutes 29 seconds, then 1 gram of Biolase will liquefy 6,510 grams of starch within a minute's' time—(18 :0.015 × 30 :5.5, or 6,510).

The time and the corresponding coefficients of liquefaction are given in the following tabulation:

TABULATION IX

	Quantity of Biolase (grams)	Temperature (deg. C.)	Time of Liquefying (minutes)	Coefficient of Liquefaction
No. 1..	0.015	37.50	5.50	6,540
No. 2..	0.030	37.50	2.70	6,540
No. 3..	0.030+100	37.50	2.75	6,540
No. 4..	0.030	50.00	2.70	6,570
No. 5..	0.030	50.00	2.00	9,000

From tabulation IX it is seen, in the first place, that the time of liquefying decreases with the increase in the quantity of Biolase used; in the second place, the rapidity of the liquefying process increases with the increase in the temperature, not very markedly but appreciably; in the third place, that the addition of sodium chloride resulted in practically no noticeable action on the progress of the liquefying process.

By studying the figures in the last column of tabulation IX—that is, the liquefaction coefficients—it will be noticed that these figures may seem too large. There is, unfortunately, but little literature on this subject and but few figures with which these may be compared. Thus one investigation revealed the fact that the coefficient of liquefaction for Biolase C3 was 2,200 (see *Melliand's Textilberichte*, 1925, page 184ff). The Biolase C20, therefore, has approximately seven times the effectiveness of Biolase C3; and if the above figure is accepted as correct, then the coefficient of liquefaction for Biolase C20 is equal to 140,000. As one can see, this figure is in excess of what has been found in this research.

Investigation Into the Nature of Viscose

By E. Berl and A. Lange
From the Technical High School, Darmstadt.

Translated from Cellulosechemie by Dr. Paul Bartholow

THOUGH the viscose reaction has received since its discovery an exhaustive investigation, it cannot be said that absolute clearness on this subject has been reached, even to-day. According to an opinion alleged to be that of the discoverers of viscose, Cross and Bevan, the ripening of viscose is of this nature—that in the ripening process the single cellulose molecule $C_6H_{10}O_5$ undergoes polymerization with the xanthagen nucleus, whereby, as ripening proceeds, the complexes C_{12} — — — — C_{18} — — — — C_{24} arise. These results are based not only on the data afforded by the iodine titration of viscose, which show that from one xanthogen nucleus more and more cellulose compounds result as ripening goes on, but also on the increasing viscosity of viscose, which through coagulation may reach very high figures. We have previously shown that ripening is not linked with a polymerization of the cellulose molecule, but rather it has to do with a process of hydrolysis, which with the formation of free cellulose-xanthate acid and cleavage of this acid gives off cellulose. This cellulose enters into still greater complexes, until finally the pulp coagulates. This process has a certain analogy with the separation of sulphur in a thiosulphate solution after further acidifying. But in these circumstances the free thio-sulphurous acid cannot exist by itself and splits off, with the precipitation of free sulphur, which, as investigation with the ultramicroscope shows, enters into still greater complexes not visible at first to the eye; until here, too, a form of coagulation occurs, that is, the formation of a mass of microscopical particles.

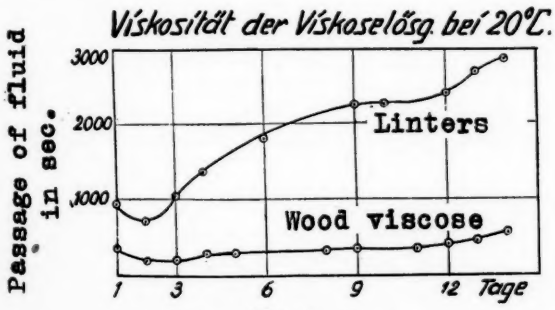


Fig. 1

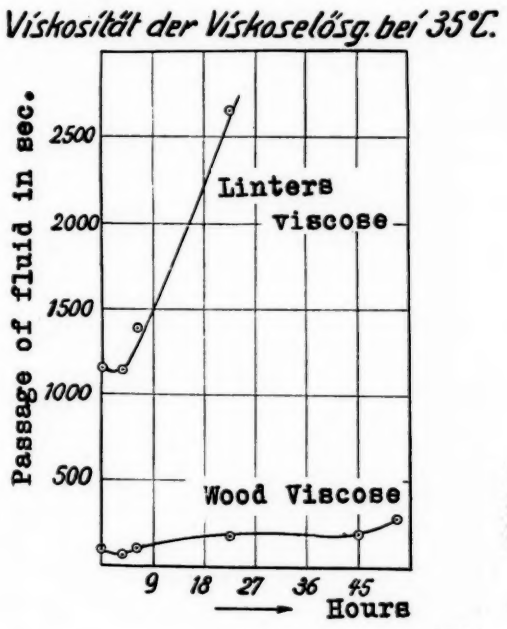


Fig. 2

That during the ripening process there is no actual polymerization of cellulose, but a linking together of smaller micella chains to larger, appears to be so from the following researches. Linters and wood cellulose viscose were precipitated in different ways after definite intervals of time—either with neutral sodium chloride or acid bisulphate solution. The resulting products were washed for a long time—two or three weeks—until they were absolutely neutral; they were then dehydrated with

dry air. The products were carefully nitrated to the same hardness; after drying tested for bound nitrogen and then examined in acetone solutions of 1, 2 and 3 per cent.

A large number of experiments showed that the viscosity of nitrate solutions is an important index of the greater or smaller decomposition of cellulose. The investigations of R. O. Herzog have shown that in various solutions of cellulose nitrate the size of the micella is not changed. Accordingly we may speak, at least qualitatively, that provided nitration is homogeneous, the internal viscosity of the nitrate swellings in acetone is a measure of the "molecular weight of the micella." This relation will be exhaustively discussed later. High viscosities indicate high micellar molecular weights, low viscosities, small micellar molecular weights and thereby a greater decomposition.

From the subjoined tables the interesting facts appear that, independent of the increase in the internal viscosity of the viscose solution after passage of a minimum (See Figs. 1 and 2), the curves which represent the viscosity of the nitrates obtained from the cellulose precipitated in acetone solution (See Figs. 3 to 6), disclose a differ-

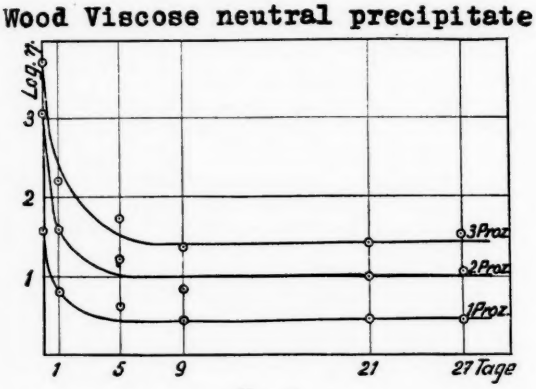


Fig. 3

ent behavior. All these curves show a marked decline in the internal viscosity in the first stage of ripening, while from ripe viscose solutions the cellulose nitrate separated gives swelling with a similar amount of internal viscosity.

From these investigations the following conclusions may be drawn:

1. The internal viscosity of viscose from linters is connected with the higher molecular weight of the micella molecule which is higher in cellulose from linters than in cellulose viscose solutions prepared from wood cellulose. (See Figs. 1 and 2.)

2. The life of viscose solutions declines with the rise in temperature. A high degree of viscosity is reached, when the temperature is high, much quicker with linters viscose than with wood pulp viscose. (See Figs. 1 and 2.)

3. The initial fall in the viscosity curve of the viscose solution is to be explained in this way—that in consequence of the action of caustic soda on the cellulose complex, a decomposition of the cellulose takes place, which after awhile comes to an end. The cellulose formed by the hydrolysis of the cellulose xanthate increases with the increase in the time of ripening together with the

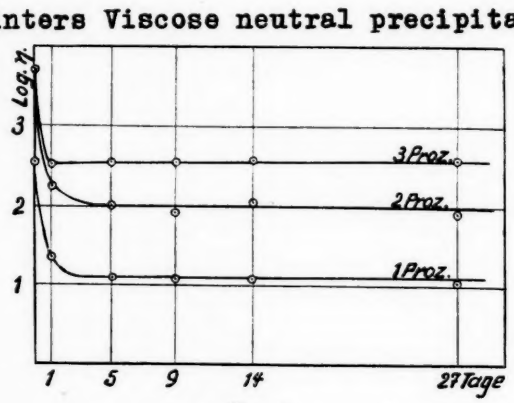


Fig. 4

constantly growing links of micella, which cause a rise in viscosity. The viscosity curve of a viscose solution depends, however, on two different reactions.

4. The internal viscosity of the cellulose nitrates formed from the viscose solution at first declines quickly with the increase in the time of ripening, in order subsequently with prolonged ripening to remain constant. The decrease during the first days of ripening is to be explained by the alkaline decomposition of the complex cellulose molecule (See Figs. 3 to 6.)

5. The viscosity curve of the cellulose nitrate formed from linters is materially higher than the nitrate from wood cellulose (See Figs. 3 and 4) compared with Figs. 5 and 6. This permits in the same way of the conclusion set forth under 1, that linters cellulose is composed of a much more complex molecule than wood cellulose.

6. A considerable difference in the inner viscosity of cellulose precipitated with acid salt and afterwards nitrated and dissolved, as compared with neutral precipitate subsequently treated in the same manner, exists in only a restricted amount. The acid precipitate appears to decrease only slightly the molecular weight of the micella as compared with the preparation produced with neutral means (Cf. Fig. 3 with Fig. 4 and Fig. 5 with Fig. 6).

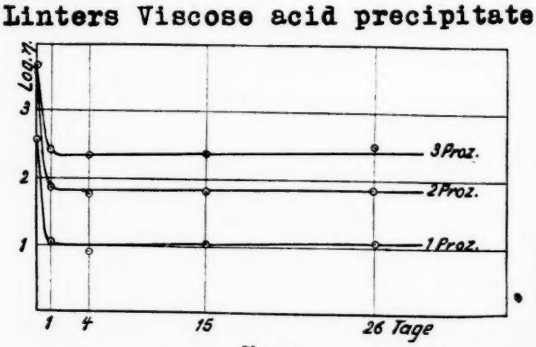


Fig. 5

Experimental Part

Linters thoroughly deprived of fat, and wood pulp were made into viscose in the usual manner, and the conditions of the experiment carefully maintained equal. The viscosity of the viscose solution thus obtained was determined with Ostwald's viscosimeter. The values obtained are given in Figs. 1 and 2. After a determined interval the precipitate was taken up with saturated sodium chloride solution or with an acid fluid, which consisted of 40 gms. sodium bisulphate, 7 gms. of 60 per cent sulphuric acid and 60 gms. of water. A thin stream of viscose was poured into the precipitating bath and allowed to stand in the bath until coagulation was complete. The series of precipitation experiments was carried out at 20 deg. Cent. The cellulose products thus obtained were nitrated in an acid mixture containing

43.60 per cent HNO_3
44.11 per cent H_2SO_4
0.29 per cent N_2O_4
120.00 per cent H_2O

in the ratio of 1 part of cellulose to 50 parts nitrous acid at —7 deg. Cent, the regenerated cellulose having been

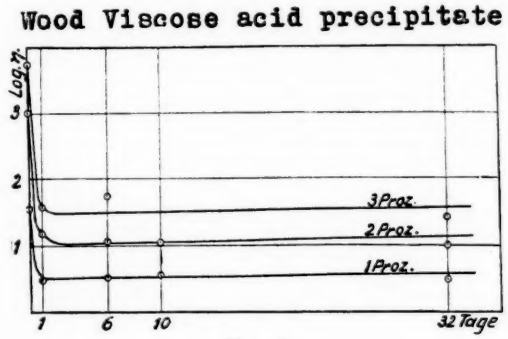


Fig. 6

previously extracted with ether and dried over phosphoric acid anhydride. The nitrates obtained by nitration were dissolved in acetone and the relative inner viscosity determined by the following formula:

$$e = \frac{t \times s}{t_1 \times s_1}$$

where t and t_1 designate the time of outflow of the nitrate solution, that is, the solvent, while s and s_1 the specific gravity of the nitrate solution or solvent. The results obtained are given in Figs. 3, 4, 5 and 6, where the time of precipitation is expressed as abscissae values, and the logarithm of the inner viscosity as ordinates.

Samuel B. Wood, a former president of the Blackstone Valley Mills Association, is now in charge of the dyeing department of the Paton Manufacturing Company, Ltd., Sherbrooke, Quebec, Canada.

Dyestuff Interests to Benefit by Protection of Industrial Property

By Waldon Fawcett

TO say that the American dyestuff industry will benefit in an exceptional degree by improvement in the protection afforded industrial property is merely another way of saying that dyestuff interests have an unusual number of contacts with this class of intangible assets. "Industrial property," as the term has come to be commonly employed, embraces most of the mediums of commodity identification and good-will capitalization. Trade-marks, trade names, brands, labels, sales slogans, distinguishing characters or figures, and original ornamental designs (as in the case of textile patterns) are the means of investing merchandise with recognition value that have been lumped in the designation, "industrial property."

Before turning to the news of to-day and to-morrow which tells of additional safeguards against imitation, infringement and substitution, it is worth while to give a passing glance at some of the influences which have cooperated to place the resources of identification in higher esteem. One factor, unquestionably—a tribute to the efficacy of modern advertising—is the extent to which the American public has been educated to buy *brands*. That is, to buy by name rather than on specification. The possibility of the enactment by Congress of a bill to legalize the fixing and enforcement of resale prices has also contributed, because the price-fixing privilege, if it ever comes, will be restricted to commodities identified by trade-mark or brand.

But the main incentive in the field of dyestuffs and allied products is the quickening of competition. As contenders for trade multiply in any given line there is an inevitable urge upon all producers or owners of wares of quality to set their goods apart from the mass by means of marks recognizable by the trade and by the general public. As by-products of latter-day competition and the changes that it has made in the general structure of distribution we have the rapid rise in popularity of private branding, a scheme of proxy identification whereby goods are made for, but not by, the marketers whose names they bear. In some lines, jobbers and wholesalers, threatened by the tendency of producers to deal directly with retailers, are strengthening their positions by private branding. Mail-order houses, or catalog houses so called, have become exploiters of house brands. Even retailers, notably the chain store organizations, have taken advantage of mass buying power to secure goods under their own brands. The presence in any industry of productive facilities in excess of consumptive power, is an invitation to tenders for private branding, since it is obvious that producers need outlets for the surplus output of their factories, however loyal they may be to their own mill brands.

Prodded by the new conditions and new necessities which this spurt in commodity identification has induced,

Federal authority has set about to modernize the system of certification whereby it attests the monopolistic rights of firms or individuals in specified pieces of industrial property. Notable in this service was the transfer of the U. S. Patent Office from the jurisdiction of the Department of the Interior to the Department of Commerce and with that an increase in the staff of the Trade-Mark Division which permits applications for registration to be handled more expeditiously.

The most important projects for the entrenchment of vested rights in industrial property are pending, however, because these require the passage of acts by Congress. A beginning was made by the 69th Congress, with certain needed improvements in the patent system of the nation, following hard upon energetic American participation in the international conference at the Hague which brought fuller recognition of the rights of United States inventors and patent owners. The 70th Congress will have before it complimentary measures that are needed to modernize the whole system for the insurance of intangible assets. The first of the measures that have been made ready for consideration by the national legislature at its next sitting is a bill to revise and consolidate the trade-mark laws of the nation. The second revolutionary innovation is contained in a measure which would abolish the present system of design patents and install in its place a plan for registering or recording, under the copyright laws, original, ornamental designs applied to articles of manufacture. The third contemplated reform would overhaul the existing copyright system. Not alone as it applies to the protection of intellectual and artistic productions, but likewise to that offshoot of the main system which affords shelter for labels and advertising prints—the latter being subject matter that relates to but is not borne by articles of manufacture.

Color Designations

At many points, the various phases of this elaborate scheme of modernization is calculated to make intimate contact with dyestuffs interests. As one case in point, let us take the matter of color designations. Since the Federal courts have ruled that there can be no trade-mark right in mere color and since the tribunals at the U. S. Patent Office has rigidly enforced the ban on descriptive names or words as trade-marks many members of the industries that thrive upon color have been at their wits end for means of commodity identification. The only salvation has lain in the hope of finding a term that is suggestive but stops short of the descriptive. The proposed shake-up of the basic trade-mark law would relieve this embarrassment to an extent by permitting the registration of words which, through not less than five years exclusive use by one party, had acquired "secondary meaning," indicative of a given source or ownership.

So, too, with color designs, relaxation and amplification of existing statutes would prove a stimulant to industry by restraining the piracy of designs which has grown apace as the popular rewards of novelty have risen. The contemplated new arrangements would grant protection to any design which is a work of original authorship, rather than exacting actual invention as does the present law. The routine of design protection would be shortened and quickened as a cure for the present plight wherein producers of seasonal designs find that, very often, the vogue of a distinctive pattern has come and gone 'ere a patent is obtainable. Finally, the improved system of design protection is counted upon to make it possible for a pioneer in design to safeguard his motif or motifs by protecting all plausible variants or alternatives of his cherished design. One of the hardships of the present inadequate system of design protection is the opportunity for pirates or imitators to lean upon the inspiration of an originator by hurrying into competitive markets with cheap productions which digress from the genuine just enough to evade the law but not sufficiently to interfere with sales to the inattentive.

The expansion of Federal governmental activities on behalf of security in industrial property is not wholly on the regulatory side. No less important to the business man, who is called upon to select new brands or buttress established trade-marks, are the advisory services and informative resources which Uncle Sam has developed in recent years. For one thing, there has been the placing on a practical basis of the reference function of the trade-mark files in the clearing house for trade-marks at the U. S. Patent Office. By means of subject and alphabetical indexes and cross-indexes it is now possible for the layman to "search" the roster of 200,000 registered marks and thereby ascertain whether a branding idea has been anticipated in the same line of trade.

No less constructive is the "intelligence service" of the Trade-Mark Section, Division of Commercial Laws, U. S. Bureau of Foreign and Domestic Commerce. Here is an institution that has developed, during the past half-dozen years, an unbelievably efficient sentry service against the pirating of United States trade-marks in foreign countries. Working through Consular agencies and Uncle Sam's other branch offices all over the globe, the Trade-Mark Section transmits warning promptly to the American owner when an attempt is made at any foreign capital to obtain unauthorized registration for a mark of United States origin. More than that, the vigilantees at Washington will, if desired, place the owner of the imperiled brand in touch with responsible attorneys at the scene who will conduct the opposition proceedings to thwart the invader.

EULAN PROCESS IN ENGLAND

Mothproofed woolen piece goods are being produced by the Bradford Dyers' Association of Bradford, England, according to a dispatch from Consul Robert B. Macatee. The Eulan process for mothproofing is used by the association, and it is also mentioned that the process is being tried by other British firms.

Dyes Imported Through New York and Other Ports During August

Compiled by the Chemical Division of the Bureau of Foreign and Domestic Commerce in Collaboration with the Chemical Division of the United States Tariff Commission

KEY TO ABBREVIATIONS OF MANUFACTURERS' NAMES

1—THE SIX LEADING GERMAN COMPANIES

IG—Interessen-Gemeinschaft der Farbenindustrie.
A—Actien-Gesellschaft fur Anilin-Fabrikation, Berlin. Founded 1873.
B—Badische Anilin-und-Soda-Fabrik, Ludwigshafen-on-the-Rhine. Founded 1865.
By—Farbenfabriken, vormals Friedr. Bayer & Co., Leverkusen-on-the-Rhine. Founded 1862
C—Leopold Cassella & Co., Frankfort-on-the-Main. Founded 1870.
K—Kalle & Co., A. G., Biebrich-on-the-Rhine. Founded 1870.
M—Farbwerke, vormals Meister Lucius & Bruning, Hochst-on-the Main. Founded 1862.

2—THE SMALLER GERMAN COMPANIES

BK—Leipziger Anilinfabrik Boyer & Kegel, Furstenberg. near Leipzig. Founded 1882.
CG—Chemikaliewerk Griesheim G. m. b. H., Griesheim-on-the-Main. Founded 1882.
CJ—Carl Jager G. m. b. H., Anilinfarbenfabrik, Dusseldorf. Founded 1823
GrE—Chemische Fabrik Griesheim-Electron, Offenbach-on-the-Main. Founded 1842.
L—Farbwerk Mulheim, vormals A. Leonhardt & Co., Mulheim-on-the-Main. Founded 1879
Seig.—G. Seigle Corporation, Stuttgart.
tM—Chemische Fabriken, vormals Weiler ter Meer, Uerdingen-on-the-Rhine. Founded 1877.
WD—Wulfing, Dahl & Co., A. G. Barmen. Founded 1842.

3—SWISS COMPANIES (ALL AT BASEL)

DH—Farbwerke vormals L. Durand, Huguenin & Co. Founded 1871.
G—Anilinfarben-und Extract-Fabriken, vormals Joh. Rud. Geigy. Founded 1764.
I—Gesellschaft fur chemische Industrie. Founded 1885.
S—Chemische Fabrik, vormals Sandoz & Co. Founded 1887

4—DUTCH AND FRENCH COMPANIES

FA—Farbwerk Ammersfoort, Ammersfoort, Netherlands. Founded 1888
NF—Niederlandische Farben-und-Chemikalienfabrik Delft, Delft, Netherlands. Founded 1897.
CN—Compagnie Nationale de Matieres Colorantes et Produits Chimiques. Founded 1917. (Etablissements Kuhlmann merged with this company in 1923.)
P—Societe Anonyme des Matieres Colorantes et Produits Chimiques St. Denis (formerly A. Poirrier). Founded 1830.

5—ENGLISH COMPANIES

Bro—Brotherton & Co., Ltd., City Chambers, Leeds.
BAC—British Alizarine Co., Ltd., Manchester
BD—British Dyestuffs Corporation, Ltd., London.
Cl Co.—The Clayton Aniline Co., Ltd., Clayton, Manchester.
CV—The Colne Vale Dye & Chemical Co., Ltd., Milnsbridge, Huddersfield.
Hol—L. B. Holliday & Co., Ltd., Huddersfield.
Scot—Scottish Dyes, Ltd., Grangemouth.

FOREIGN dyes imported through New York and other ports during the month of August totaled 401,122 pounds, with an invoice value of $339,269. This was considerably more than the total for the previous three months, but was exceeded by the imports for March and April. Imports by ports were as follows: New York, 373,161 pounds, valued at $306,666; Boston, 22,961 pounds, valued at $26,169; Albany, 5,000 pounds, valued at $6,434.

Imports of Synthetic Dyes

1927—	Pounds	Invoice Value
January	196,620	$186,387
February	312,277	262,364
March	404,714	352,414
April	402,783	323,732
May	349,476	265,752
June	318,450	253,054
July	263,162	214,853
August	401,122	339,269
Total (eight months)	2,648,604	$2,197,825
1926—		
January	300,441	$283,635
February	369,045	377,638
March	487,804	435,891
April	437,526	401,606
May	392,739	343,745
June	333,319	317,896
July	351,425	303,079
August	380,414	298,159
Total (eight months)	3,052,713	$2,761,649

Per Cent of Dyes by Country of Shipment

	Aug. 1927	Aug. 1926	Jan.-Aug. 1927	Jan.-Aug. 1926
Germany	57.0	47.0	56.36	49.75
Switzerland	25.0	34.0	25.66	35.13
France	2.5	2.5	3.31	3.52
England	6.0	0.5	4.40	3.73
Belgium	4.0	5.5	5.53	4.12
Canada	4.5	8.5	2.94	1.75
Italy	1.0	2.0	1.71	1.62
Netherlands	—	—	0.09	0.38

Dye Imports by Ports

	Pounds	Invoice Value
New York	373,161	$306,666
Boston	22,961	26,169
Albany	5,000	6,434
Total	401,122	$339,269

Five Leading Dyes, by Quantity, Imported During August

	Pounds
Thionol Green B	15,648
Vat Golden Yellow GK (single strength)	15,000
Rhodamine B (single strength)	13,925
Indanthrene Blue GCD (single strength)	11,988
Thioindigo Red 3B (single strength)	6,871

Dyes and Intermediates Remaining in Bonded Customs Warehouse

	Dyes and Colors (pounds)	Intermediates (pounds)
December 31, 1926	360,488	562,536
January 31, 1927	615,542	647,692
February 28, 1927	896,059	719,055
March 31, 1927	869,963	712,617
April 30, 1927	1,125,983	827,260
May 31, 1927	1,065,143	813,137
June 30, 1927	1,003,847	866,105

The dyes in this report are grouped by both Colour Index and Schultz numbers, and, in the case of those which could not be identified by either number, the classification according to the ordinary method of application was adopted. As the pastes and powders of the vat dyes vary widely in strength and quantity, each vat dye has been reduced—in nearly every case—to a single strength basis.

DYES OF COAL-TAR ORIGIN

Col. Index No.	Schultz No.	Name of Dye and Mfr.	Quantity (pounds)
10	7	Naphthol Yellow SXX—(IG)	20
24	36	Moti Orange R—(IG)	75
32	182	Fast Sulphon Violet 5BS Conc.—(S)	300
54	64	Sorrel Red X—(IG)	700
70	—	Rapid Fast Red GL Paste—(IG)	2,000
80	83	Ponceau 3R—(IG)	75
127	118	Geranine G—(By)	55
150	144	Orange S—(IG)	220
172	159	Acid Alizarine Black R—(IG)	500
195	177	Alizarine Yellow GD—(S) Chrome Yellow DF Extra——(IG)	930
219	—	Eriochrome Flavine A Conc.—(G)	1,102
224	193	Silk Red ST—(IG)	50
225	194	Thiazine Red RXX—(IG)	250
256	230	Cloth Red 3G Extra—(IG)	50
276	248	Wool Fast Scarlet R Conc.—(G)	110
278	—	Benzo Fast Rubine BL—(IG) Chlorantine Fast Red 7BL—(I)	531
288	257	Sulphon Cyanine G—(IG)	1,100
307	265	Acid Milling Black B—(G)	2,205
316	273	Diaminogene Blue NA—(C) Diajamine Blue BR Conc.—(S)	3,229
319	—	Benzo Fast Heliotrope 2RL—(IG)	250
321	—	Diamine Fast Scarlet 2G—(IG)	100
324	—	Diazo Brilliant Orange GR Extra—(By)	110
325	—	Brilliant Benzo Violet B—(IG) Diamine Fast Violet FFBN—(IG)	550
326	279	Benzo Fast Orange WS—(IG) Benzo Fast Scarlet 8BS—(IG)	600
346	296	Cotton Yellow GX Extra—(IG)	100
349	—	Chlorantine Fast Yellow 4GL—(I)	882
368	306	Ignamine Orange 3G—(IG)	100
382	319	Chloramine Red B, 3B—(S)	6,870
403	—	Diphenyl Fast Gray BC—(G)	331
409	339	Diamine Orange B—(IG)	500
436	358	Chloramine Brilliant Red 8B Conc.—(S) Chloramine Red 8BS Powder—(By) Toluylene Red—(IG)	2,765
440	360	Ignamine Orange R—(IG)	250
459	373	Congo Orange R—(IG) Diamine Orange F—(IG)	1,500
487	400	Acid Anthracene Red 3B—(IG) Brilliant Milling Red R—(IG)	550
488	404	Diamine Yellow N Powder—(IG)	50
516	423	Blue NBB—(IG)	1,500
577	457	Trisulphon Brown 2G Conc.—(S)	2,000
590	471	Poluphenyl Blue GC—(G)	551
596	476	Benzo Chrome Brown G—(IG)	100
598	477	Diphenyl Brown GS—(G)	551
621	11	Chloramine Orange G—(IG)	100
629	207	Diphenyl Fast Brown GF—(G)	551
632	18	Diphenyl Fast Yellow RL Supra—(G)	55
636	19	Fast Light Yellow 2G—(IG) Fast Light Yellow 3G—(IG)	672
639	22	Supra Light Yellow 2GL—(IG) Xylene Light Yellow 2G—(S)	1,397
645	—	Kiton Fast Yellow 3G—(I)	551
653	—	Pyrazol Orange G Conc.—(S) Pyrazol Orange R Conc.—(S)	2,200
661	498	Turquoise Blue G—(IG)	286
663	500	Setopaline Conc.—(G)	220
667	503	Benzyl Green B—(I) Erioviridine B Supra—(G) Poseidon Green SGX—(IG)	2,292
670	505	Light Green SF Yellowish XX—(IG)	200
671	506	Erioglaucine AP—(G)	6,614
672	507	Xylene Blue VS Conc.—(S)	715
673	508	Xylene Blue AS Conc.—(S)	2,999
676	511	Para Rosaniline Base—(IG)	5,000
677	512	Magenta AB Powder—(IG)	2,000
681	516	Crystal Violet Extra—(IG)	500
682	518	Ethyl Violet—(IG)	1,000
690	522	Victoria Blue 4R Highly Conc.—(IG)	500
696	528	Kiton Fast Violet 10B—(I)	551
699	531	Eriocyanine AC—(G)	1,102
700	532	Alkali Violet A Extra Conc.—(IG)	55
704	536	Alkali Blue No. 4—(IG)	1,000
706	538	Methyl Lyons Blue—(G)	441
707	539	Opal Blue Bluish—(IG)	150
709	540	New Blue RS—(I)	110
710	541	Brilliant Sky Blue 5G—(I)	100
712	543	Patent Blue V—(I)	2,000
714	545	Kiton Blue A—(I) Patent Blue A—(IG) Poseidon Blue BR Conc., Extra—(IG) Poseidon Blue BXX—(IG)	3,251

Col. Index No.	Schultz No.	Name of Dye and Mfr.	Quantity (pounds)
715	546	Blue FF Powder—(C)	
		Cyanol Extra—(C)	1,706
717	548	Acid Violet 6BNOO—(IG)	100
718	549	Brilliant Chrome Violet 4B—(DH)	110
720	551	Eriochrome Azurol BC—(G)	2,205
723	554	Chrome Azurol S Conc.—(G)	1,102
727	557	Chrome Violet—(G)	220
729	559	Basic Pure Blue BO—(B)	
		Victoria Pure Blue BO—(IG)	2,901
735	564	Alkali Fast Green 3G—(IG)	
		Erio Green B Supra—(G)	
		Poseidon Green VGGX—(IG)	1,802
736	565	Wool Blue G Extra—(IG)	200
743	570	Rhodamine S—(IG)	50
748	579	Sulpho Rhodamine B Extra—(IG)	200
749	573	Rhodamine B Conc. (s. s.)—(G)	
		Rhodamine B Extra (s. s.)—(Q)	
		Rhodamine B Extra (s. s.)—(IG)	
		Rhodamine B Extra Base (s. s.)—(IG)	13,925
752	571	Rhodamine 6G Extra (s. s.)—(IG)	500
762	—	Chromorhodine BN—(DH)	880
788	603	Rhoduline Orange NO—(IG)	100
789	—	Sabaphosphine S Conc.—(S)	200
793	606	Phosphine O—(IG)	
		Phosphine 3R—(IG)	
		Leather Yellow GC—(G)	2,410
795	607	Runic AL Conc.—(G)	400
797	608	Patent Phosphine GRNTN—(G)	
		Patent Phosphine RRDX—(G)	2,000
801	613	Quinoline Yellow Extra—(G)	200
815	618	Basic Yellow T—(G)	600
828	672	Azocarmine GX—(G)	850
829	673	Rosinduline 2B Bluish—(K)	220
833	—	Wool Fast Blue BL—(By)	
		Wool Fast Blue GL—(IG)	
		Wool Fast Blue GL—(By)	1,906
847	686	Iris Violet Extra—(IG)	25
861	699	Solid Blue S (water soluble)—(IG)	100
865	700	Nigrosine T—(IG)	200
873	681	Methylene Gray B New—(IG)	100
		Direct Gray R Paste—(G)	1,984
875	923	Nako PS—(G)	500
879	—	Chromazurine E—(DH)	220
894	637	Gallamine Blue Extra Paste—(G)	1,543
902	642	Phenocyanine VS, R—(DH)	435
908	648	Fluorescent Blue—(S)	11
924	660	Methylene Green G Extra—(I)	220
927	663	New Methylene Blue N f. f. s.—(IG)	500
931	667	Indochromine RR Conc.—(S)	500
1019	774	Alizarine Black S Paste—(IG)	492
1027	778	Alizarine VI Extra Pure Paste—(IG)	4,410
1033	779	Alizarine Orange AO Paste—(BDC)	2,784
		Alizarine Orange A Paste—(IG)	
		Alizarine Orange SW Powder—(IG)	50
1034	780	Alizarine Red SZ—(S)	
		Alizarine Red IWS Powder—(M)	2,176
1040	784	Alizarine Red SX Extra Paste—(IG)	1,323
1054	858	Alizarine Light Blue B Conc.—(S)	
		Alizarine Saphirol B Powder—(IG)	1,050
1060	801	Anthracene Blue SWG Powder—(IG)	
		Anthracene Blue SWGG Ex. Powder—(IG)	400
1063	790	Anthracene Blue SWR Powder—(IG)	200
1064	—	Alizarine Cyclamine R Paste—(IG)	1,588
1073	852	Alizarine Blue JR Powder—(By)	
		Alizarine Irisol R Powder—(IG)	1,568
1076	859	Alizarine Light Blue R Conc.—(S)	1,000
1077	860	Alizarine Direct Blue BGAOO—(IG)	500
1078	865	Alizarine Cyanine Green 3G Ex. Pdr.—(IG)	600
1080	853	Special Violet B—(IG)	500
1084	854	Alizarine Viridine FF Paste—(IG)	1,491
1087	851	Alizarine Leveling Blue B—(C)	500
1088	855	Alizarine Sky Blue B—(By)	771
1091	—	Alizarine Rubinol 5G—(IG)	500
1095	759	Anthra Yellow GC Paste—(IG)	
		Anthra Yellow GC Paste—(B)	
		Anthra Yellow GC Powder (s. s.)—(IG)	
		Vat Yellow GC Paste—(B)	4,561
1096	760	Vat Golden Orange G Powder (s. s.)—(IG)	800
1097	761	Vat Orange RRT Paste Fine—(IG)	
		Vat Orange RRTS Powder (s. s.)—(IG)	2,838
1099	763	Vat Dark Blue BOA Paste Fine—(IG)	1,437
1102	765	Indanthrene Black BB Paste—(IG)	
		Indanthrene Black BB Powder (s. s.)—(IG)	1,364
1104	767	Vat Brilliant Violet RR Paste Fine—(IG)	1,000
1108	839	Vat Blue RK Paste—(IG)	300
1111	844	Vat Blue 5G Powder (s. s.)—(IG)	800
1113	842	Indanthrene Blue GCD Dbl. Pst. (s. s.)—(B)	
		Vat Blue GCD Dbl. Pst. (s. s.)—(IG)	
		Vat Blue GCD Dbl. Pst. Fine (s. s.)—(IG)	
		Vat Blue GCDN Powder (s. s.)—(IG)	11,988
1114	—	Vat Blue BCD Paste Fine—(B)	
		Vat Blue BCSO Powder (s. s.)—(IG)	662
1115	843	Cibanone Blue G Powder—(I)	331
1118	849	Vat Yellow G Double Paste (s. s.)—(IG)	2,944
1128	818	Algol Pink R Powder (s. s.)—(IG)	800
1133	819	Algol Red R Extra Powder (s. s.)—(IG)	2,000
1135	820	Vat Brilliant Violet RK Paste—(IG)	
		Vat Brilliant Violet RK Pdr. (s. s.)—(By)	1,240
1144	870	Vat Corinth RK Powder (s. s.)—(IG)	400
1146	828	Anthra Bordeaux B Powder (s. s.)—(IG)	200
1150	833	Grelanone Olive B Paste—(GrE)	
		Grelanone Olive B Powder (s. s.)—(GrE)	
		Vat Olive B Paste—(GrE)	
		Vat Olive R Paste—(IG)	3,218
1151	—	Grelanone Brown RR Paste—(GrE)	
		Grelanone Brown RR Powder (s. s.)—(GrE)	
		Vat Brown R Paste—(IG)	6,512
1152	—	Vat Brown G Paste—(IG)	2,779
1161	871	Vat Red Violet RRN New Pdr. (s. s.)—(IG)	
		Vat Red Violet RRK Paste Fine—(IG)	919
1162	831	Vat Red RK Paste Fine—(IG)	952
1163	832	Vat Violet BN Paste Fine—(IG)	481
1172	794	Cibanone Black B Powder (s. s.)—(I)	1,760
1178	876	Indigosol O—(IG)	300
1183	880	Indigo BASF Pure RB Paste—(IG)	100
1184	881	Brilliant Indigo 4B Paste Fine—(IG)	
		Brilliant Indigo 4B Powder (s. s.)—(B)	6,794
1189	887	Brilliant Indigo 4G Paste Fine—(IG)	1,000
1190	885	Brilliant Indigo B Paste Fine—(IG)	2,453
1207	912	Anthra Red B Paste Fine—(IG)	467
1211	910	Helindone Pink BN Powder (s. s.)—(IG)	250
1212	918	Thioindigo Red 3B Paste—(K)	
		Thioindigo Red 3B Powder (s. s.)—(K)	
		Vat Red Violet RH Paste Fine—(IG)	6,871
1217	913	Hydron Orange RF Paste—(IG)	500
1218	915	Vat Scarlet R Paste—(IG)	
		Vat Scarlet R Powder (s. s.)—(IG)	2,550
1228	907	Anthra Scarlet 2G Paste—(B)	
		Thioindigo Scarlet 2G Paste—(IG)	2,318

UNIDENTIFIED DYES

Acid Dyes

Name of Dye and Manufacturer	Quantity (pounds)
Acid Alizarine Red G—(IG)	100
Acid Milling Yellow G Conc.—(S)	1,000
Acid Pure Blue BR Supra—(G)	55
Acid Violet R Extra—(IG)	300
Alizarine Fast Light Brown GL Powder—(IG)	100
Alizarine Supra Blue SES Powder—(IG)	100
Alizarine Supra Sky R—(IG)	100
Alkali Fast Green 10G—(IG)	200
Brilliant Acid Blue FF—(By)	
Brilliant Acid Blue FF—(IG)	690
Brilliant Milling Blue B—(C)	2,185
Brilliant Wool Blue FFB Extra—(IG)	300
Brilliant Wool Blue FFR Extra—(IG)	
Brilliant Wool Blue FFR Extra—(By)	750
Cloth Fast Brown 5R—(I)	551
Cloth Fast Orange G—(I)	440
Cloth Fast Red 3B—(I)	661
Erio Fast Brown B—(G)	55
Fast Acid Pink B—(IG)	100
Indocyanine B—(A)	330
Indocyanine FF—(IG)	200
Ink Blue BITN, BITBN—(IG)	600
Lanasol Blue R—(I)	220
Metanil Red 3B Extra—(IG)	200
Milling Orange G—(IG)	500
Milling Yellow O—(IG)	500
Naphthol Black BGN Conc.—(IG)	100
Neolan Black 2G—(I)	110
Neolan Blue GG—(I)	1,653
Neolan Bordeaux R—(I)	110
Neolan Orange R—(I)	220
Neolan Pink B—(I)	551
Neolan Violet Brown B—(I)	331
Neolan Yellow R—(I)	441
Novazol Blue B—(G)	3,306
Onis 3B, 5B—(IG)	500
Pilatus Black SF—(IG)	200
Pilatus Fast Blue B—(IG)	100
Pilatus Fast Claret RNX—(IG)	100
Pilatus Fast Green BL Conc.—(IG)	200
Polar Red G Conc.—(G)	2,205
Polar Yellow 2G Conc.—(G)	1,102
Sulphon Orange G—(IG)	300
Supramine Blue—(IG)	300
Supramine Brown G—(IG)	600
Supramine Brown R—(IG)	100
Supramine Red 3B—(IG)	1,200
Supramine Red 2G—(IG)	200
Supramine Yellow G—(IG)	100
Supramine Yellow R—(IG)	225
Wool Blue R Extra—(IG)	100
Xylene Brilliant Blue FFRX Conc.—(S)	1,000
Xylene Fast Blue FF Conc.—(S)	2,000
Xylene Milling Orange Conc.—(S)	1,000
Xylene Milling Red B Conc.—(S)	500

Vat Dyes

Name of Dye and Manufacturer	Quantity (pounds)
Alizarine Indigo 5R Paste—(IG)	500
Anthra Orange RH Paste Fine—(IG)	500
Anthra Pink B Extra Paste—(IG)	1,500
Anthra Pink R Extra Paste Fine—(IG)	2,500
Anthra Scarlet B Powder (s. s.)—(IG)	300
Ciba Brown G Paste—(I)	220
Cibanone Brown R Powder (s. s.)—(I)	1,100
Cibanone Red 4B Paste—(I)	220
Cibanone Red G Powder (s. s.)—(I)	1,100
Eridan Brilliant Scarlet B Paste—(IG)	1,000
Grelanone Red 2B Paste—(IG)	250
Helindone Blue 3R Powder (s. s.)—(IG)	250
Helindone Fast Scarlet G Paste—(IG)	1,500
Helindone Printing Black RD Paste—(IG)	6,000
Hydron Brown R Paste—(C)	
Hydron Brown R Paste—(IG)	1,535
Hydron Olive GN Paste—(IG)	1,000
Hydron Pink FF Paste—(IG)	2,000
Hydron Violet R Powder (s. s.)—(IG)	250
Hydron Violet RF Paste Highly Conc.—(IG)	250
Hydron Yellow GG Powder (s. s.)—(IG)	600
Indigosol O4B—(DH)	110
Indigosol Pink IR Extra—(DH)	55
Indigosol Violet AZB—(DH)	55
Indigosol Yellow HCG—(IG)	55
Paradone Gray B Paste—(LBH)	112
Thioindigo Rose RN Extra Powder (s. s.)—(IG)	250
Thioindigo Violet R Paste—(K)	110
Vat Blue RSN Powder—(IG)	125
Vat Blue RZ Double Paste (s. s.)—(IG)	3,020
Vat Blue Green B Double Paste Fine (s. s.)—(IG)	1,010
Vat Brilliant Blue 3G Paste Fine—(IG)	200
Vat Brilliant Blue R Paste Fine—(IG)	744
Vat Brilliant Orange RK Paste—(IG)	700
Vat Brown GG Powder (s. s.)—(IG)	400
Vat Golden Orange 3G Powder—(IG)	400
Vat Golden Yellow GK Double Paste Fine (s. s.)—(IG)	15,000
Vat Gray 3B Double Paste Fine (s. s.)—(IG)	930
Vat Green G Double Paste Fine (s. s.)—(IG)	200
Vat Khaki GG Paste—(IG	1,000
Vat Orange 3R Paste Fine—(IG)	472
Vat Pink B Double Paste—(IG)	2,800
Vat Printing Black BR Paste—(By)	441
Vat Printing Brown R Paste—(By)	1,237
Vat Red BK Paste Fine—(IG)	
Vat Red BK Powder (s. s.)—(IG)	954
Vat Red GG Powder (s. s.)—(IG)	800
Vat Red Brown R Paste—(B)	483
Vat Scarlet 3B Powder (s. s.)—(C)	660
Vat Yellow GF Powder (s. s.)—(IG)	400
Vatamine Scarlet 2B Powder—(Q)	38

Mordant and Chrome Dyes

Name of Dye and Manufacturer	Quantity (pounds)
Acid Alizarine Gray G—(IG)	400
Acid Anthracene Brown PG—(By)	606
Acid Anthracene Red 5BL—(IG)	100
Acid Anthracene Red 5BD—(IG)	50
Acid Chrome Blue FFR—(IG)	100
Acid Chrome Red B—(IG)	100
Acid Chrome Yellow 3GL—(IG)	100
Autochrome Gray G—(M)	441
Azol Printing Red 2B Extra—(IG)	100
Chrome Fast Xanthine 2R—(DH)	110
Chrome Printing Red B—(DH)	220
Chromocitronine 3R—(DH)	220
Chromocitronine V—(DH)	110
Chromophenine FKN—(DH)	110
Chromorhodine 6GN Extra—(DH)	330
Chromorhodine 6GS Extra—(DH)	22
Chromovesuoine RA—(DH)	110
Chromoxcine Brilliant Violet BD—(IG)	100
Chromoxcine Brilliant Violet SB—(IG)	420
Chromoxcine Pure Blue B—(IG)	800

Name of Dye and Manufacturer	Quantity (pounds)
Chromoxcine Pure Blue BLD—(IG)	100
Erio Anthracene Brown R—(G)	220
Eriochrome Brilliant Violet B Supra—(G)	359
Eriochrome Brown SWN Supra—(G)	220
Eriochrome Verdone S—(G)	551
Gallophenine P—(G)	331
Omega Chrome Brown EB—(S)	1,000

Direct Dyes

Benzo Chrome Brown B—(IG)	100
Benzo Dark Brown Extra—(IG)	99
Benzo Fast Black L—(IG)	1,050
Benzo Fast Blue 4GL—(IG)	200
Benzo Fast Bordeaux 6BL—(IG)	610
Benzo Fast Brown 3GL—(IG)	1,200
Benzo Fast Bordeaux RL—(IG)	1,400
Benzo Fast Copper Blue B—(IG)	100
Benzo Fast Gray BL—(IG)	500
Benzo Fast Light Scarlet 4BL—(IG)	200
Benzo Fast Orange 2RL—(IG)	800
Benzo Fast Red 6BL—(IG)	100
Benzo Fast Yellow RL—(IG)	900
Benzo Rhoduline Red 3B—(IG)	400
Brilliant Benzo Green B—(By)	330
Brilliant Benzo Fast Yellow GL—(IG)	400
Brilliant Congo Violet R—(IG)	300
Brilliant Fast Blue 3BX—(IG)	
Brilliant Fast Blue 3BX—(By)	310
Brilliant Pure Yellow 6GX—(By)	280
Brilliant Sky Blue 8G Extra—(IG)	600
Brilliant Sky Blue R—(IG)	700
Brilliant Sky Blue 2RM—(IG)	150
Chicago Red III—(G)	2,205
Chloramine Fast Orange G Conc.—(S)	500
Chloramine Light Violet R—(S)	500
Chlorantine Fast Blue 2GL—(I)	1,102
Chlorantine Fast Brown 3RL—(I)	1,162
Chlorantine Fast Green B—(I)	661
Chlorantine Fast Orange 2RL—(I)	441
Chlorantine Fast Red 5BL—(I)	1,433
Chlorantine Fast Violet 5BL—(I)	1,543
Chlorantine Fast Violet RL—(I)	3,967
Chlorazol Fast Orange AG—(BDC)	1,200
Developed Blue 3GL—(By)	551
Developing Blue B—(IG)	800
Diamine Azo Fast Yellow 2G—(C)	221
Diamine Catechine B—(IG)	250
Diamine Fast Brown R—(IG)	700
Diamine Fast Brown GBB—(IG)	1,300
Diamine Fast Orange EG—(IG)	300
Diamine Fast Orange ER—(IG)	750
Diaminogene Blue GG—(C)	991
Diazanil Scarlet 3BA Conc.—(IG)	100
Diazo Black VG—(I)——	551
Diazo Brilliant Green 3G—(IG)	820
Diazo Brilliant Scarlet BG—(IG)	25
Diazo Brown 6G—(IG)	250
Diazo Brown 3R—(IG)	100
Diazo Fast Black SD—(IG)	700
Diazo Fast Bordeaux BL—(IG)	200
Diazo Fast Red 7BL—(IG)	200
Diazo Fast Violet BL—(By)	220
Diazo Fast Violet 3RL—(IG)	100
Diazo Green 3G—(IG)	50
Diazo Indigo Blue 2RL—(IG)	300
Diazo Rubine B—(IG)	200
Diazo Sky Blue B—(IG)	
Diazo Sky Blue B—(By)	1,501
Diphenyl Brown BBNC—(G)	2,205
Diphenyl Fast Bordeaux BC—(G)	110
Diphenyl Fast Bronze B—(G)	551
Direct Fast Yellow BL—(Q)	441
Direct Safranine RW—(I)	220
Discharge Blue B—(IG)	100
Fast Cotton Gray VL—(IG)	1,500
Fast Cotton Rubine 3B—(IG)	100
Fast Cotton Violet 4R—(IG)	100
Minaxo Light Pink BBX—(IG)	200
Neutral Gray NY—(IG)	200
Oxydiamine Brown KBBS—(IG)	50
Pluto Brown GG—(IG)	200
Rosanthrene Orange R—(I)	110
Zambesi Black F—(IG)	500
Zambesi Pure Blue 4BG—(IG)	100

Direct Dyes for Artificial Silk

Cellit Blue R—(IG)	100
Cellit Fast Brown G Powder—(IG)	47
Celliton Blue Extra Paste—(IG)	200
Celliton Fast Blue B Paste—(IG)	200
Celliton Fast Red Violet R Paste—(IG)	300
Celliton Fast Yellow 2R—(IG)	100
Celliton Orange R Paste—(IG)	100
Celliton Red R Paste—(IG)	300
Celliton Yellow 3G Paste—(IG)	100
Cibacete Orange 3G Paste—(I)	165
Cibacete Red GR Paste—(I)	110
Cibacete Violet 2R Paste—(I)	110
Cibacete Yellow 3G Paste—(I)	220
Cibacete Yellow R Paste—(I)	55
Duranol Blue G Paste—(BDC)	828
Duranol Orange G Paste—(BDC)	106
Duranol Red 2B Paste—(BDC)	100
Duranol Red G Paste—(BDC)	268
Ionamine A—(BDC)	200
Ionamine Red KA—(BDC)	100
Setacyl Direct Blue G Powder—(G)	1,102
Setacyl Direct Blue R Powder—(G)	551
Setacyl Direct Violet R Powder—(G)	220

Rapid Fast Dyes

Rapid Fast Orange RH Paste—(IG)	1,000
Rapid Fast Red B Paste—(IG)	200
Rapid Fast Red LB Paste—(IG)	300
Rapid Fast Red GZ Paste—(IG)	3,000

Basic Dyes

Acridine Flavine R—(DH)	331
Acridine Flavine RD—(DH)	110
Astra Violet FFD—(IG)	100
Brilliant Rhoduline Blue R—(IG)	100
Rhodamine 6GDN Extra (s. s.)—(IG)	2,500
Rhoduline Blue 5B—(IG)	25
Thio Violet 5R—(DH)	55

Sulphur Dyes

Indocarbon SN—(IG)	1,000
Katigene Indigo GLGG Extra—(IG)	900
Kurgan Violet 3RX—(IG)	100
Pyrogene Green GK—(I)	331
Sulphide New Blue BL—(IG)	441
Sulphur Brown CL4R—(IG)	500
Thivnal Brilliant Blue 6B Conc.—(S)	500
Thionol Brown O—(BDC)	2,240
Thionol Green B—(BDC)	15,648

Color-Lake and Spirit-Soluble Dyes

Alizarine Astrol Powder (oil soluble)—(IG)	1,050
Alizarine Cyanine Green G Ex. Pdr. (oil soluble)—(IG)	25
Hansa Yellow G Powder—(IG)	
Lake Yellow G Powder—(M)	649
Hansa Yellow GGR Extra Powder—(IG)	200
Hansa Yellow GSA Powder—(IG)	3,000
Hansa Yellow 5G Powder—(IG)	250
Helio Bordeaux BL Paste—(IG)	
Helio Bordeaux BL Powder (s. s.)—(IG)	5,531
Helio Fast Rubine 2BL—(IG)	50
Helio Red RMT Extra Powder—(IG)	450
Oil Green ALB Lumps—(IG)	50
Paper Fast Bordeaux B—(IG)	500
Stone Rubine BN Powder—(IG)	400
Tero Carmine FB—(IG)	50

Unclassified Dyes

Chestnut Brown—(BDC)	120
Grasol Yellow R—(G)	11
Icyl Violet B—(BDC)	100
Whitex (washing blue)—(Eze Mfg. Co.)	11,356

INITIAL TREATMENT OF CHEMICAL BURNS OF THE EYE

(*Discussion by W. B. Hubbard, M.D., Henry Ford Hospital, Detroit, Mich.; to be presented before the Sixteenth Annual Safety Congress, Chicago, Ill., September* 26-30.)

The time factor in treating chemical burns cannot be too strongly emphasized. A slight delay before first aid treatment may mean the difference between a useful and a blind eye. Keeping this in mind, the first aid treatment must be the most convenient method. Water is the most convenient and, as has been shown, actually lengthens the time interval of safety.

The effect of the solutions used in treatment was noted on control rats. No damage was done to the control eyes. As alcohol burns of the eye might occur by accident, or by treating injured eyes, experiments were done to note the strength and time necessary to produce burns. Various dilutions of grain alcohol were placed in the eyes and observed as in the other experiments. It was found that dilutions up to 75 per cent caused no permanent destruction of the epithelium of the cornea.

The benefit of neutralization before or after washing was considered. Experiments were done on rat eyes in groups of thirteen with nitric acid, 20 per cent, and with sulphuric acid, 50 per cent. The first group was neutralized and immediately washed with water. The second group was washed and neutralized immediately afterward. The third group was washed, and the fourth group was neutralized. Neutralization followed by washing resulted in more serious damage than with washing alone. The results were very similar to those obtained by neutralization alone. Neutralization immediately after a thorough irrigation gave the same results as obtained with irrigation only. We concluded that neutralization before irrigation was harmful, and that it was of no benefit afterward.

Occasionally iodine eye burns are seen. Experiment with this drug showed that irrigation was a better treatment than neutralization. There was practically no difference in the results obtained by removal with alcohol, 25 per cent, and with water. Neutralization with starch solution resulted in severe destruction.

In advising the use of drinking fountains in the first aid treatment, it must be considered that in burns of both eyes a man may not be able to run. In that emergency, the man should be helped to a fountain, or water should be dashed into his eyes. In placing drinking fountains the ideal would be one within ten seconds reach of every workman. Each fountain should be placarded directing the workmen to use the fountain in case of chemical eye burn.

After our experiments were practically completed and our opinions formed, we discovered that water alone was being used in a Detroit Willard Battery Service Station, where a water hose is turned on a man's eye immediately after an acid burn. They report very good results from this treatment. Few cases, however, receive proper treatment, as the following typical case shows: Mr. B. D. was employed by the B. M. Co. He was struck in both eyes by a flying spray of hydrochloric acid. He was treated fifteen minutes later at the First Aid Station with a few drops of some solution, probably a weak alkali. From the time of the accident, vision in both eyes was blurred, and at the end of one month, he presented himself at the hospital. At that time vision in each eye was only 0.1, and small, fairly superficial permanent opacities were present on the cornea of both eyes. From our experiments we feel that washing with water in 10 to 15 seconds would have prevented any loss of vision.

An example of proper treatment is the case of Mr. S. K.: boric acid solution was being instilled into his eye for a mild infection. By mistake, phenol drops were used. Realizing some mistake, he rushed immediately to a tap and thoroughly irrigated the eye with water. Examination of the eye after several weeks showed only a small opacity, and vision was only slightly impaired. Had the acid been allowed to remain in the eye until removed by tears or until neutralization was possible, complete loss of vision may have resulted.

Delay in first aid treatment of chemical burns of the eye must be avoided. Any available solution, which is not harmful in itself, is of more value immediately, than any other treatment in five minutes.

The nation's laundry bill is nearly $4,000,000 annually, and is still growing.

AMERICAN DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

LOUIS A. OLNEY
PROFESSOR OF CHEMISTRY AND DYEING, LOWELL TEXTILE SCHOOL
Directing Editor

CLAYTON HOAGLAND
Managing Editor

MYRON DREW REESER
Advertising Manager

Published biweekly by
HOWES PUBLISHING CO., INC.
90 William Street, New York City

A. P. HOWES, *President* E. S. PREDMORE, *Secretary*

Subscription price $5.00 per year; Canadian $5.50; foreign $6.00

Vol. XVI September 19, 1927 No. 16

REINFORCEMENTS NEEDED

THE manager of a large New England mill was asked what he looked for in employing his superintendents. "I select a superintendent as I would select a secretary," he answered. "His technical knowledge of mill processes counts most with me, just as my secretary's knowledge of shorthand, grammar and spelling marks her as competent and reliable. Most of our superintendents have risen from lower positions in this mill, but they obtained their technical training in textile schools before they came here or during their early working years."

The rule by which this mill man measures his assistants may seem strict to that remnant of the old guard who do not put much stock in "book learning" and deride theories and thesis. They cling to the last few shreds of a tattered tradition—a tradition that men rise in the textile industry either through hard work or influence; and, they would add, mostly influence.

But the young men who left college and high school last June and who, at this season, are eagerly seeking the door to some worthy career in the textile industry, should not take too seriously the old guard's assurance that practical experience alone, or mere influence, equips men for the best positions. This is not so.

Many young graduates have been attracted to the doorstep of the textile industry, and are now lining up for mill positions that offer what seem to be golden opportunities. Some of these aspirants have influence in the industry, but too few of them have technical training. To these the words of the mill man quoted above should be significant. Instead of entering the mill impatient to show their ability to work up into higher positions they had far better learn first the craft and the science on which the whole elaborate structure of textile manufacturing is founded. Once in possession of that knowledge they will be equipped to outstrip the mere plodder who relies entirely on his elementary schooling and practical experience.

Modern mill owners, it is true, recognize the rare virtues of plain, honest hard work. But along with experience and ability to work they require of their important men a technical education. Almost invariably the men they employ to manage their mills have been technically trained. And these managers, realizing that their training has helped them more than anything else to advance, naturally employ superintendents and overseers who have also been technically trained.

This demand for men with a technical textile education extends down the ladder even to the ranks of assistant dyers, bleachers, finishers and other workers. Numbers of those who entered the industry from technical schools eight or ten years ago now hold executive positions and are facing that line-up of young hopefuls seeking careers in the mill; and they choose from the line those who have been trained like themselves, in order to reinforce the ranks of the industry. But there is not enough of such sturdy timber to supply the demand. The textile schools have three and four calls for every graduate available.

Those who enter the textile industry directly from secondary schools or colleges in the face of this demand for the technically trained may believe that they will gain three or four years' start over their classmates who first enter textile school. The fallacy of this reasoning has been demonstrated many times by tracing the course of the technically learned man beside that of the untrained worker. While the first pursues his studies at textile school the untrained man, if he is intelligent and industrious, forges slowly upward, gains some good experience and is actually ahead when the former leaves school to take up work at the mill. But very soon, in two or three years, the technically educated man passes his more experienced but less educated colleague, and ten years later the gap between them has widened far beyond the ability of the unschooled worker to span. Exceptions are granted; we are speaking of average cases.

The American textile industry has pinned its faith to the growing army of technically trained experts that now form the sturdy framework of the personnel in every progressive mill. It is upon these technical men the industry is relying to improve and perfect its manufacturing processes, that it may squarely meet the competition in the world's markets, and it is upon the technically trained men that the industry is bestowing its best positions and its honors.

UNETHICAL

A STANDARD color card has been issued in Japan by the Yokohama Silk Exporters' Guild, in cooperation with the Yokohama Export Dyers' Guild. It is called the "Universal Color Card of Japan" and is issued "for the benefit of the dyeing industry and Japan's overseas silk trade generally." The card contains 170 standard shades and looks exactly like the shade card pub-

lished by the American Textile Color Card Association. Its ribbon swatches are woven and mounted like those in the American card. Even some of the American color names, such as "Pink Pearl" and "Burnt Almond," appear in the Japanese card. As to the shades themselves, nearly all of them are the familiar American standards.

The Yokohama Silk Exporters' Guild no doubt looks upon the production of this card as a monumental achievement. But the guild deserves little credit for its work. Nowhere upon the card is credit given to the Textile Color Card Association of America, whose well-known standard and seasonal cards supplied the Japanese with their standards.

It was no child's play to sell our textile industry on the project of conforming its products to definite color standards. The Textile Color Card Association toiled long and strenuously to establish its standard and seasonal shade cards as the criteria, and only after discouraging years of the hardest kind of work was it able to pursuade not only the American industry but many foreign textile interests to follow its standards in producing colored apparel. The Japanese silk guild should have given credit to the Association for creating the original card from which its excellent copy was made. The Japanese gain very little by such plagiarism and, fortunately, the Textile Color Card Association loses just as little.

SQUEEZING THE BRITISH DYE MANUFACTURER

YOUR typical Englishman is a man of iron. With incredible doggedness he endures hardships and adversity that would soon make another cry, "Enough!" It must be this innate English pluck that forbids the smaller British dyestuff manufacturers from emitting a louder wail over their distressing predicament. Perhaps their situation is not quite so painful as it appears to us, but at least our inference is drawn from several painful facts.

First is the fact that the small, independent dye producers in England have been enduring the competition of the newly formed British Chemical trust, the Imperial Chemical Industries, Ltd., which, as our readers know, includes the former British Dyestuffs Corporation and Scottish Dyes, Ltd. This powerful combine ought to be able to undersell every independent maker in the country, and most likely does control the reins of the British dye trade. Its negotiations with the German dye barons have not apparently resulted in any definite agreement as yet, but when that agreement is reached we do not see how it can be at all favorable to the smaller manufacturers in Great Britain. Even under present conditions, with dye imports held in check by a licensing system, there is considerable competition from German dyes.

The British licensing scheme requires that licenses or permits be secured for every importation of foreign dyes and also fixes a "price factor" that has acted to protect the domestic dye industry. Until this month the price factor permitted British consumers to import foreign colors only if the price of the *domestic equivalent* was two and one-half times the pre-war price. But on September 1 this factor was reduced, by a decision of the Dyestuffs Licensing Committee, to two times the pre-war price, which represents a cut of 20 per cent. This reduction has caused the British dye producers to lower their prices 20 per cent, in order to protect their own trade against sharper competition from foreign colors, which would surely result from the lowering of the import barrier.

It is pointed out that the 20 per cent reduction in the prices of their colors will place British dye manufacturers on an economic level with other European countries, since prices on the Continent are also about two times over the pre-war scale. If such is the case, then dye prices in England before this cut must have been greatly inflated. Only this fact can explain how the smaller British dye plants are able to take such a drastic decrease in profits. What the effect would be on the American dye industry if our prices were suddenly lowered 20 per cent we dare not imagine.

Neither competition from domestic and foreign trusts nor slashes in price contributes to the happiness and welfare of an industry's smaller units. The independent British dye producer has both to contend with and it is for that reason we describe his predicament as painful. But what must make his situation even more intolerable is the continual grumbling of the textile trade over his prices. Someone is, to use Skippy's phrase, "always belittlin'" the dye manufacturers' attempts to develop better products and more profitable markets. Some consumers are forever harping on the high cost of dyestuffs, complaining that they cannot compete with foreign mills that buy dyes more cheaply, and overlooking the advantages of a convenient home supply. To these grumblers the Clayton Aniline Company, Ltd., recently replied:

> "It has been the fashion for a very considerable period for a section of the textile trades to belittle every effort which has been made to extend the manufacture of chemicals and dyestuffs here, and to praise out of all proportion the abilities of foreign competitors. We have on numerous occasions investigated these cases of alleged loss of trade due to the high cost of dyestuffs, and in every instance have been able to prove that the actual cost of the dyeware on the finished fabric is so small as to be a comparatively negligible factor, and that the true explanation is that labor costs and conditions on the Continent are so much more favorable than at present prevail in this country that even if the cost of dyestuffs were omitted entirely, the result would be the same."

A sound, sensible argument! It calls to mind what has been reiterated so often in this country regarding the cost of dyes in fabrics and agrees perfectly with the findings of our Tariff Commission, which last year made a study of those costs.

But is it not plain that the lot of the small British dye-producers is certainly not one to be envied? Their home

markets dominated by a powerful rival, their prices depressed lower than at any time since the war and their endeavors belittled by a disgruntled consuming trade, is it not surprising that they have not set up a louder wail for justice and fair play? They might even be justified in believing, at times, that they are in worse straights than their American brethren.

EVER DYE A HORSE?

A STORY so gray and bewhiskered that it may be new to some of this generation is told of a certain Rastus who was out of work and was told by a friend of a vacancy in a local laundry. He admitted he had once been employed in a laundry, asked the name of the establishment offering the position and was informed that it was the Eagle Laundry. "But ah aint never washed a eagle," he protested.

We can imagine a similar protest being voiced by a dyer if he were asked to dye a horse. For the benefit of the uninformed it should be said that horse dyeing is not an overcrowded profession. In fact, there never has been a very lively demand for specially colored horses, but there is every prospect that the horse-dyeing trade would be a most lucrative one in the event that the United States became embroiled in a war.

The War Department has decided that army horses used in the next war should be dyed or replaced by darker animals, as a measure of safety against enemy aircraft. A study of the subject by the Cavalry School at Fort Riley showed that white horses or those with light patches were easily visible from the air.

We shall watch patiently for the appearance among the new shade cards of our dye manufacturers of a Horse Blue GX.

CHARLES E. MULLIN APPOINTED CLEMSON PROFESSOR

Charles E. Mullin, well known to the readers of the REPORTER as the author of the important series of articles on "Dyeing Acetate Silk" and of the later series on the chemistry of wool, has accepted an appointment as Professor of Chemistry and Dyeing at Clemson College, South Carolina. For the past several years Professor Mullin has been a consulting chemist with headquarters in Camden, N. J., and more lately in Philadelphia. He took over the duties of his post at Clemson a few days ago.

Clemson College, it is announced, is formulating plans to develop its textile department to a point where it will be able to co-operate more actively with the Southern textile industry. At present about one hundred students are enrolled in the various textile courses of the college The United States Government maintains a cotton testing station at Clemson under the direction of Dr. H. H. Willis, head of the textile department.

The enlargement of the textile department's facilities, it is expected, will make possible more extensive research on such subjects as the use of rayon in cotton goods.

GERMAN-JAPANESE TREATY PROVIDES FOR DYE IMPORTS

Details of the dyestuff imports agreement provided for in the new treaty of commerce and navigation between Germany and Japan recently concluded at Tokio were made known in a recent announcement from the Japanese Foreign Office, reported by the Department of Commerce.

The sections concerning importations of dyes were submitted in the form of a separate memorandum, and, according to the official announcement of the Japanese Foreign Office, they covered the following points:

Germany will import sixty-five kinds of dyestuffs enumerated in a table. In the event of Japan coming to produce dyes not included in the table the new colors will be added to those listed. The imports of dyestuffs will be through Kobe and Yokohama only. This dyestuffs agreement is to come into effect simultaneously with the enforcement of the German-Japanese treaty of commerce and navigation.

The treaty was signed at Tokio but has not yet been ratified by either Government. By the provisions of the treaty the relations of the two countries are formally restored to their pre-war status.

CARPET MANUFACTURERS FORM INSTITUTE

A national association having as its purpose the advancement of the American carpet industry was recently formed by the carpet manufacturers of the country, and will be known as the Institute of Carpet Manufacturers of America. The headquarters of the new organization are in the Transportation Building, Washington, D. C.

An intensive program of marketing research is being planned by which it is hoped to collect and disseminate the basic facts pertaining to production and distribution of carpets in this country and abroad. The immediate activities of the institute will center around development of domestic and foreign carpet markets as well as the gathering of statistical information covering raw materials, production, stocks, shipments and other factors of manufacturing and distribution.

RAYON TECHNOLOGY TAUGHT AT NEW YORK UNIVERSITY

A course of instruction in rayon is being given by the School of Retailing of New York University under the direction of Alton A. Cook, Sc.M. The course comprises eight lectures, dealing with every phase of rayon manufacture, processing and marketing. Some of the lectures treat of the methods of manufacturing rayon, the chemistry of rayon, its dyeing, bleaching and finishing, its physical testing and its distribution, covering the fundamentals necessary to a thorough understanding of the cellulose fiber and its uses.

RECENT LITERATURE

Organic Chemistry for Dyers

Elementary Organic Chemistry, by Louis A. Olney, D.Sc. Howes Publishing Company. 191 pages. $3.00.

Professor Olney deserves the thanks of all men who are engaged in the profession of dyeing for undertaking a work of this character which will satisfy a long-felt want. He is especially well qualified to interpret organic chemistry in terms which will be understood by dyers and finishers, because of his long and successful experience in teaching this subject at the Lowell Textile School to students who are planning to become actively engaged in dyeing and finishing.

This book is so arranged that a person who has only an elementary knowledge of chemistry can start with the simple basic facts presented in the first chapters and progress by easy stages until he will actually gain a good working knowledge of the dyestuffs which are in common use. It may be sincerely recommended to those dyers who wish to get a better understanding of the tools of their trade, and thereby put themselves in line for real advancement in their profession. W. R. M.

The Launderability of Textiles

Textile Fabrics, Their Selection and Care from the Standpoint of Use, Wear and Launderability. By George H. Johnson. Harper & Bros. 385 pages. Illustrated. $5.00.

To give the laundry owner, the manufacturer of textiles and the ultimate consumer practical information on the structure, wearing qualities and methods of laundering all classes of woven goods, from cotton sheets to the daintiest of silk garments, is the purpose of this book. The author is director of the Department of Research of the Laundryowners' National Association and Senior Fellow at the Mellon Institute of Industrial Research. His book shows that he has thoroughly mastered his subject.

The volume opens with a clear and comprehensive discussion of the textile fibers in general. The weaving process is described almost from a laundering point of view. All types of fabric goods commonly laundered are described, and, in addition, materials such as knit goods, hosiery and rugs are considered at length, for they are also encountered daily in the modern power laundry.

The processes of textile dyeing, bleaching, printing and finishing are described concisely but plainly, since each of these steps in modern mill practice has an important bearing on the life of textiles and their reaction to the laundering process. Natural agencies and corrosive substances that attack textiles are similarly treated. The section on the dyeing process discusses briefly and lucidly each of the principle classes of dyestuffs employed in standard mill practice, with notes on their properties on the different fibers to which they are applied.

The chapter on textile testing should be most instructive to laundrymen and to the general consumer of textiles, either of whom have but slight notion of the purpose of laboratory testing of fabrics in the determination of their wearing qualities and color fastness. In concluding his treatise the author discusses in an intelligent and very interesting manner the responsibilities of the textile manufacturer, the launderer, the retailer and the consumer in the selection and conservation of textile fabrics and garments.

The illustrations deserve special praise. There are 176 of them and they are certainly not the least valuable part of the book. Not merely pictures of fabrics, they illustrate strikingly the principles and specific cases elucidated in the text.

"Textile Fabrics" is an ably handled book; it is the most important contribution to the campaign for the "conservation of textiles" that has appeared so far.

A HISTORY OF SILK DYEING

The "History of the Silk Dyeing Industry in the United States," which was published serially in Silk, has been issued in book form and is now ready for distribution. The volume is handsomely bound and printed and is illustrated with hundreds of rare prints, old engravings and photographs.

This is the first history of the silk dyeing industry to be published. The text was compiled and prepared by Albert H. Huesser, of Paterson, N. J. As Mr. Huesser had access to numerous old documents, and was in intimate contact with most of the outstanding figures in the silk dyeing trade of Paterson, Philadelphia and elsewhere, his efforts have produced a book of unusual historical value. A considerable portion of the text is devoted to a description of the ancient and modern methods of dyeing silk in all parts of the world.

The book is published by the Silk Publishing Company and priced at $10 per copy. A more detailed review of it will appear in these columns later.

The Mathieson Alkali Works, Inc., have appointed H. D. Honan as St. Louis district sales manager, to replace F. H. Lovenberg. Mr. Honan was formerly connected with the Philadelphia district sales office. Mr. Lovenberg has been transferred to the New England district sales office.

RECENT PATENTS

Finished Fabric and Process of Making Same.

(June 21, 1927; 1,633,160)

Joseph Bennett, of North Adams, Mass., assignor to Consolidated Textile Corporation, of New York, N. Y., a corporation of Delaware.

This invention relates to artificial fibers and more particularly to the specialized treatment thereof for the purpose of improving the appearance.

It is well known that regenerated cellulose fibers, when they are made from xanthates or nitrates or from other intermediates, possess a fineness of fiber, a strength and softness which is highly desirable, but they also possess a high luster which for many purposes limits their application undesirably.

One of the objects of this invention is, therefore, to remove wholly or in part the luster from such fibers, while retaining their other desirable properties.

It has heretofore been customary, moreover, to manufacture fabrics from combinations of lustrous and lusterless fibers, in order to obtain desirable pattern effects. Such manufacture, however, has required the use of a Jacquard loom, with all the consequent difficulties and expense.

It is a further object of this invention to produce a process in accordance with which the luster can be removed in localized areas from the finished fabric, whereby the patern may be produced by printing rather than by weaving.

It is a further object to produce a process of the character described, which will be simple and efficient in operation and which will leave the fibers possessed of all their desirable properties and to produce a product which is highly ornamental and durable.

In accordance with this invention it has been discovered that when the regenerated cellulose fiber is subjected to the action of a strong alkali, such for example as sodium hydrate, for a limited period, that the luster is completely removed. This may in part be due to a hydration of the surface of individual fibers, or it may be a change in the physical condition of the surface thereof.

The process may be conducted generally for the purpose of producing a lusterless yarn or fabric, but it is particularly applicable to the forming of pattern effects. When treating the fiber or the fabric as a whole, the fiber may be washed in a bath of sodium hydroxide for a limited time, depending upon the weight of the cloth, and thereafter submitted to such treatment as will remove the remaining alkali by washing either with water or with a slightly acid bath.

When specifically applied to printing, the process is conducted as follows:

The pattern is printed upon the fabric with a resist paste, as for example, a mixture of British gum and magnesium sulphate, it being understood, of course, that according to the general principles of resist printing, the pattern is in reverse, that is, the resist is placed upon those portions of the fabric which are to remain lustrous.

When the resist paste has become dried, the cloth is passed through a bath of sodium hydrate of a strength and temperature dependent upon the weight and thickness of the cloth and the effect desired. After which the cloth is passed through a washing bath and preferably also a neutralizing bath such, for example, as a weak acid to eliminate the excess alkali.

As an alternative method, a paste including a caustic soda mixed, for example, with gum tragacanth, may be substituted for the resist paste. This, when printed upon the fabric and allowed to remain during a light drying operation, is enough to remove the luster from the fiber. The fabric is thereupon washed to remove the gum and neutralize the excess alkali. Either of the above processes will produce a pattern effect upon the cloth completely devoid of luster at the spots acted upon by the reagents, but without affecting the luster of the remaining portions of the goods.

Since certain changes may be made in carrying out the above process and in the product, and modifications effected in the apparatus for practising the principle thereof, without departing from the scope of the invention, it is intended that all matter contained in the above description shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood, of course, that the claims are intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

USE OF FASTER DYES RAISES BRITAIN'S DYE BILL

The demand for superior dyed fabrics has increased the dyestuff bill of Great Britain from $9,700,000 in 1913 to $24,300,000 per year at the present time, according to advice received by the Department of Commerce from Consul A. R. Thomson, of Bradford.

It is stated further than 80 per cent of the colors consumed by British dyers are manufactured by the domestic industry. However, the remaining 20 per cent now imported costs the British consumer $4,600,000, whereas the pre-war imports, which then amounted to 80 per cent of the dyes consumed, reached a total of only $8,700,000.

The production of dyestuffs at Huddersfield progressed favorably during the second quarter of 1927 under the stimulus of the fusion of that industry with the new British merger known as the Imperial Chemical Industries, Ltd.

The many color consuming interests of this district re-

garded with favor the decision of the British Dyestuffs Advisory Licensing Committee to apply to imports the factor of merely two times the pre-war prices as from September 1, instead of the present 2½ ratio. The acquiescence of the British dyemakers in this arrangement resulted in price reductions by about 20 per cent.

BRADFORD DYEING INDUSTRY EARNS LESS

Importations from Europe of piece goods for dress material have affected the profits of the dyeing industry of Bradford, England, advises the Department of Commerce in a report covering the progress of the Bradford industry for the quarter ended June 30, 1927.

About 25,000 persons are employed in the Bradford dyeing center under ordinary operating conditions, but owing to the foreign competition on colored dress goods there were periods of slack employment.

GERMANY SENDING MORE DYES TO ENGLAND

Notwithstanding efforts of the British dyeing trade to break away from foreign colors the market in England for German dyes has increased this year. Germany exported to Great Britain in 1926 five per cent of its total exports of aniline and sulphur colors, against 3 per cent in 1925; the corresponding percentage exported to British India this year was 10 per cent. The United Kingdom also received 5½ per cent of the Alizarine dyes produced in Germany, while India purchased 50 per cent.

Technical Notes from Foreign Sources

Machine Dyeing Cotton With Vat Colors

The various difficulties encountered in the dyeing of cotton in various forms with the aid of vat colors are assigned to the following causes: If the dyeing process is carried out on raw cotton at the boiling temperature, or where cotton is wetted out with a portion of bath containing caustic soda and hydrosulphite, the dye liquor which is introduced into the apparatus meets with a certain resistance in its efforts to penetrate the intercellular spaces in the cotton fiber and particularly the pores of the fiber. Due to the abatement of the penetration of the dye liquor into the material, those portions of the charge which are located in the apparatus close to the point where the dye liquor is allowed to enter are found to be more deeply colored than the rest of the material; and this difference is all the more marked the greater the affinity of leuco derivatives of vat dyestuffs for the cotton fiber. Hence, irregularly dyed products are obtained and, furthermore, the resistance of the dyed material to rubbing is bad, inasmuch as the color is merely fixed in the surface of the fiber without having penetrated inside.

In order to avoid these faults in the dyeing process and at the same time carry out the process under more economical conditions and with a greater degree of speed, the author does not wet the cotton before it comes into contact with the dye liquor, the liquor containing sodium ricinoleate. This effects easy penetration of the liquor into the cotton fibers and the process is rapid and complete in place of the slow infiltration of the liquor into the moist cotton. The acid in the apparatus and in the cotton is rapidly driven out and the liquor oxidized only in a small part at its surface, the great mass of the liquor remaining in a perfect state of reduction.

In order to reduce the cost of the dyeing process, the quantities of hydrosulphites and castor oil soap used to be kept down to the minimum. The quantities vary in accordance with the nature of the vat colors used. In preparing the main liquor there must be used on the average at least 1½ grams of sodium hydrosulphite per gram of the dyestuff. The quantity of castor oil soap (sodium ricinoleate) to use is 2½ per cent of the weight of the cotton at a maximum.

The temperature conditions vary in accordance with the character of the dyestuff employed. It is mentioned, for example, that Indanthrene Blue GCN gives the best results in a dye liquor at a temperature of 100 deg. Cent.

The author also points out that great care must be taken in loading and discharging the cotton from the apparatus, so that a mass of as great compactness possible is obtained. Any irregularity in the loading or compression of the cotton gives rise to irregular dyeing and even to white spots. (Buelletin de la Societe Industrielle de Mulhouse, 1927 number 3, pages 168-170.)

Dyeing Cellulose Acetate

The dyeing is carried out with the aid of aqueous solutions or suspensions of substantive, acid or basic dyestuffs, which contain one or more active groups, such as hydroxyl, amino, imino, nitro, nitroso, isonitroso, azidylamino, azo, and no sulpho group, or only one sulpho group and two or more active groups in the molecule. In dyeing with non-sulphonated basic dyestuffs or basic monosulphonated dyestuffs with numerous predominating active groups, salts are used at the same time, which are able to form double salts with the aforementioned basic dyestuffs. (German Patent No. 439,882.)

Sizing Silk, Rayon and Cotton

Oils are used for this purpose that contain as little drier as possible, in order to prevent the fiber from

being discolored. This refers particularly to the case of rayons. For example, an oil that contains on the average about 25 grams of cobalt resinate, cobalt oleate or cobalt acetate per 100 kgs., is employed for this purpose. One liter of this oil is mixed with 2 liters of benzine, ½ liter of China wood oil, 1/10 of a liter of a mixture of soap, benzine, mineral oil, vaseline oil or olive oil, and 30 grams of lanolin and the same amount of Japan wax. (French Patent No. 612,573.)

Fast Colored Reserves Under Aniline Black

Enol esters of vat dyestuffs are printed on fabrics which have been previously treated with the ordinary slop-padding bath for Aniline Black dyeing. These enol esters of the vat colors are obtained, for instance, by the action of acid halides on the leuco compounds of the vat dyestuffs. These enol compounds are used in the presence of acid-reacting substances. The goods are then made ready in the usual manner for the production of Aniline Black color on them. It is found that the enol ester will oxidize more readily than the aniline. (German Patent No. 438,225.)

Brightening Alizarin Pink Shades During Printing

Contamination of printing pastes which contain alizarin dyestuffs by metallic compounds during printing iron or chrome mordanted fabric and consequent "saddening" of the resulting printed effects, is avoided or corrected by the addition of 150 to 200 grams of a gelatinous solution of aluminum hydroxide per kilogram of the printing paste. This chemical is added either before or during printing. (Bulletin de la Societe Industrielle de Mulhouse, 1927, pages 123ff.)

Dyeing with Inorganic Dyestuffs

The dyeing is carried out with the aid of a dye liquor obtained by mixing the solution of metallic salt, which yields the dyestuff, in the presence of protective colloids in the colloid mill or similar working apparatus in the presence or absence of artificial or natural organic dyestuffs, the latter being used only in small amounts. Thus, for example, barium chloride is mixed with sodium chromate and a solution of dextrin in a colloid mill or in a similar dispersing machine. The dye liquor obtained in this manner can be used for dyeing wool at a temperature of 60 to 100 deg. Cent. (German Patent No. 439,459.)

Protecting Animal Fibers in Dyeing

The process of protecting animal fibers from the action of chrome mordants by the addition to the dye bath or aftertreatment bath of sulphite cellulose waste liquor, a salt of lignin sulphonic acid, cell pitch, or a sugar, particularly a pentose or a hexose, is now applied for a similar purpose to all other treatments in which a chromium compound is employed. In an example, to the bichromate-sulphuric acid bath used for the purpose of removing dye from woolen rags, is added sulphite cellulose lye, whereby the wool retains its full feel and its capacity for being spun. (British Patent No. 264,146.)

Dyeing Cellulose Acetate Mixtures

Gray Celanese (cellulose acetate) contains little impurity beyond traces of lubricating oil and requires only a mild scour before dyeing. Bleaching is carried out by the usual methods, or may be effected simultaneously with scouring at a temperature of 60 deg. Cent. Celanese materials are transparent to ultraviolet light, even after being delustered by treatment with boiling water. When Celanese is immersed in boiling water it loses its luster. Use is made of this fact to produce artificial silk materials which possess a subdued luster.

Delustering is assisted by the presence of soap, Turkey Red oil, or other substances that are capable of reducing the surface tension of the boiling liquor. The use of cellulose acetate in worsted goods is limited because of the loss of luster during such processes as crabbing and steaming, but the presence of inorganic salts such as magnesium chloride, ammonium sulphate, or sodium chloride assists the preservation of the luster (British Patent No. 246,879). Vat dyestuffs may be applied to cotton materials which contain cellulose acetate without hydrolysis of the latter, provided that phenol is added to the dye bath sufficient to combine with the excess of caustic alkali. (Journal of the Society of Dyers and Colourists, 1927, Vol. 43, pp 37-42.)

Dyeing with Chrome Colors to Shade

In dyeing loose wool with chrome dyestuffs, the general process is first to dye the fiber in an acid liquor and then to add bichromate. The addition of this salt, as is well known, has a very marked effect as a general rule on the shade of the dyed wool, with the result that its color is often far from that of the sample being matched. This difficulty is, however, no longer as great as formerly owing to the large number of dyestuffs that are now available to the dyer. If it is merely a question of a light shading of the color, then this can be very readily accomplished with the aid of acid colors, but for correcting the shade it is more advisable to employ ½ per cent of a member of the chrome dyestuffs group.

The process is carried out in the following manner: First the steam is shut off, and then the solution of dyestuff is added in a very dilute form and as thoroughly and uniformly distributed as possible. The steam is then turned on again and the boiling is continued for fifteen minutes. The process works but very sparingly on the wool, and the result is that the loose wool retains its softness and spinning qualities. It is, moreover, more to be recommended and better

results are obtained when the dyeing is carried out directly on the previously chrome mordanted wool. (Der Textilchemiker und Colorist, 1927, p. 27.)

GERMAN DYE EXPORTS TO ALL COUNTRIES LARGER

An interesting analysis of Germany's dye trade with the countries of the world is included in a report on the distribution of German aniline colors, issued recently by the United States Department of Commerce. The comparative tabulation below of Germany's exports for the first six months of this year and of 1926 indicates that practically every country is receiving more German products.

The Department announced recently that Germany's foreign trade in dyes and chemicals exceeded that of any other country. The analysis below discloses that in the three classes of dyes for which figures are given for the first half of 1927 the German supremacy of 1926 will probably be maintained. Quantities are in metric tons:

	Aniline		Alizarine		Indigo	
	1926	1927	1926	1927	1926	1927
Belgium	69	667	....	51	....	94
Bulgaria	35	111	....	....	....	14
Great Britain	483	492	65	152	....	19
Italy	313	288	32	56	94	48
Yugoslavia	94	174	....	....	....	8
Netherlands	578	609	53	82	64	95
Austria	282	386	....	19	40	16
Russia	1,431	153	56	2	105	11
Spain	135	140	25	23	25	30
Czecho-Slovakia	1,081	1,042	24	51	75	68
Hungary	143	187	....	7	33	64
British India	1,093	2,050	379	1,048	283	230
China	662	3,322	....	5	4,964	5,894
Japan	774	664	23	28	493	399
Netherlands East Indies	389	295	33	204	169	434
Siam	57	603	....	....	26	47
Oceania	51	58	....	....	31	63
Mexico	188	174	....	196	27	14
United States	353	297	125	196	10	35
Total exports	10,140	13,872	918	2,110	6,744	7,739

The three classes shown, Aniline, Alizarine and Indigo, are the most important of the dye export group. A comparison is made between the exports to certain countries for the first six months of 1926 and for the same period of 1927. From an anlysis of the statistics it is shown that during 1926 most of the aniline dyes went to Russia, Czecho-Slovakia, British India, Japan and China. Exports increased considerably during 1927, Indigo and Aniline practically 20 and 40 per cent, respectively, and Alizarine over 100 per cent. Increases on the whole were general. The outstanding increases were to the major consumers, China and British India, which countries more than doubled their imports of the previous year and accounted for 40 per cent of Germany's export. Russia reflected a decided falling off. The increases and decreases to the other markets are particularly significant.

Germany owns the controlling interest in the principal dye producing concern in Spain and has, furthermore, a treaty with Japan protecting the industry of that country which accounts for the decrease in exports and evident increase in the domestic production of dyes in Japan.

The value of the dyestuffs exported from Switzerland during the three months ended June 30, 1927, showed an increase of more than one million dollars over that of the same period of last year. The total for the 1927 period was $3,571,000; for the same three months in 1926, $2,498,000. More than 80 per cent of these exports, according to advice from Vice-Consul Scott of Basle, come from the Basle District. The recent improvement in the German demand for Swiss dyes is fully expected to continue, though dye prices have shown a decidedly lower trend, owing to the severe international competition.

The Industrial Dyeing Company, of New York, has completed arrangements for opening a branch plant at Charlotte, N. C., this unit having been incorporated as the Industrial Dyeing Company, of North Carolina. Louis L. Wisner is president, Karl Ginter, vice-president, and William H. Deerfield, secretary and treasurer. It is understood that Mr. Deerfield will be resident manager of the Charlotte plant. No details of the equipment have been announced, but it is expected that the plant will dye rayon yarns and other products now being handled by the company in New York.

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i. e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

DYE CHEMIST

Chemist with practical experience in the manufacture of alizarine or vat colors is required by domestic manufacturer of these colors. Please state general qualifications, experience, age, salary desired. Address Classified Box 413, American Dyestuff Reporter.

BLEACHERY SUPERINTENDENT

M. I. T. graduate; wide and thorough practical experience in bleaching, dyeing and finishing; experienced vat dyer; well versed in modern management principles; seeks an exacting job with a progressive concern. Address Classified Box 417, American Dyestuff Reporter.

EXPERIENCED CHEMIST

American chemist, B.Sc., with twelve years' analytical, research and manufacturing experience in the dyestuff industry seeks position where ability and loyalty will be recognized. References. Address Classified Box 418, American Dyestuff Reporter.